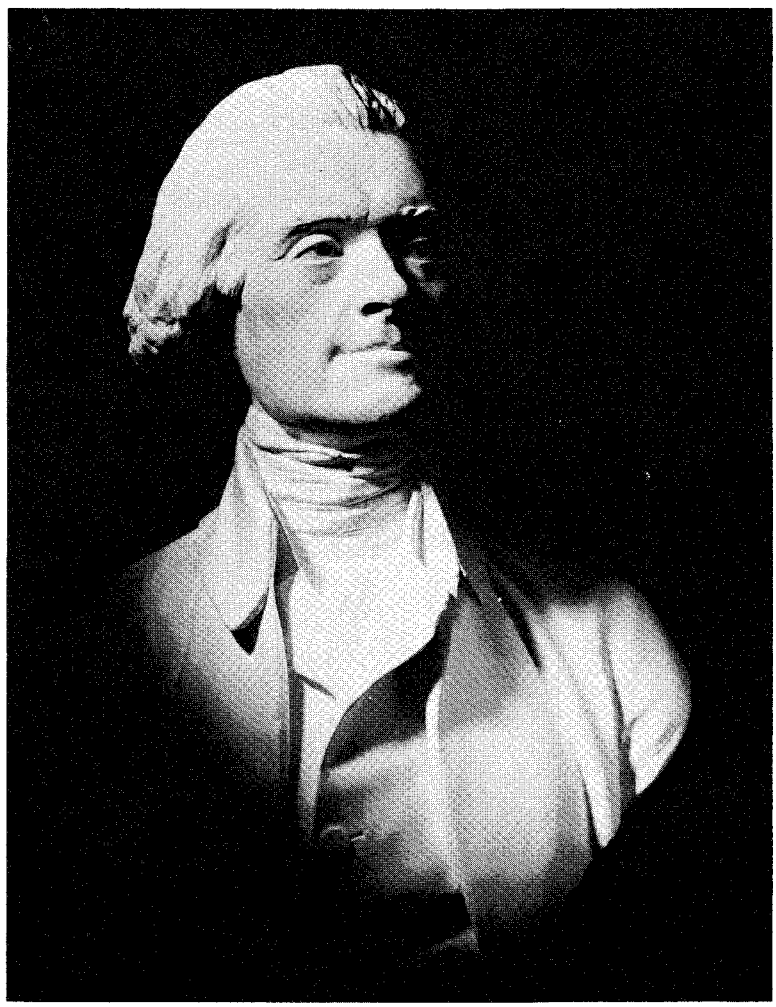
VIRGINIA DIVISION OF MINERAL RESOURCES PUBLICATION 61

THOMAS JEFFERSON AND AMERICAN VERTEBRATE PALEONTOLOGY

Silvio A. Bedini



COMMONWEALTH OF VIRGINIA

DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES
Robert C. Milici, Commissioner of Mineral Resources and State Geologist

CHARLOTTESVILLE, VIRGINIA
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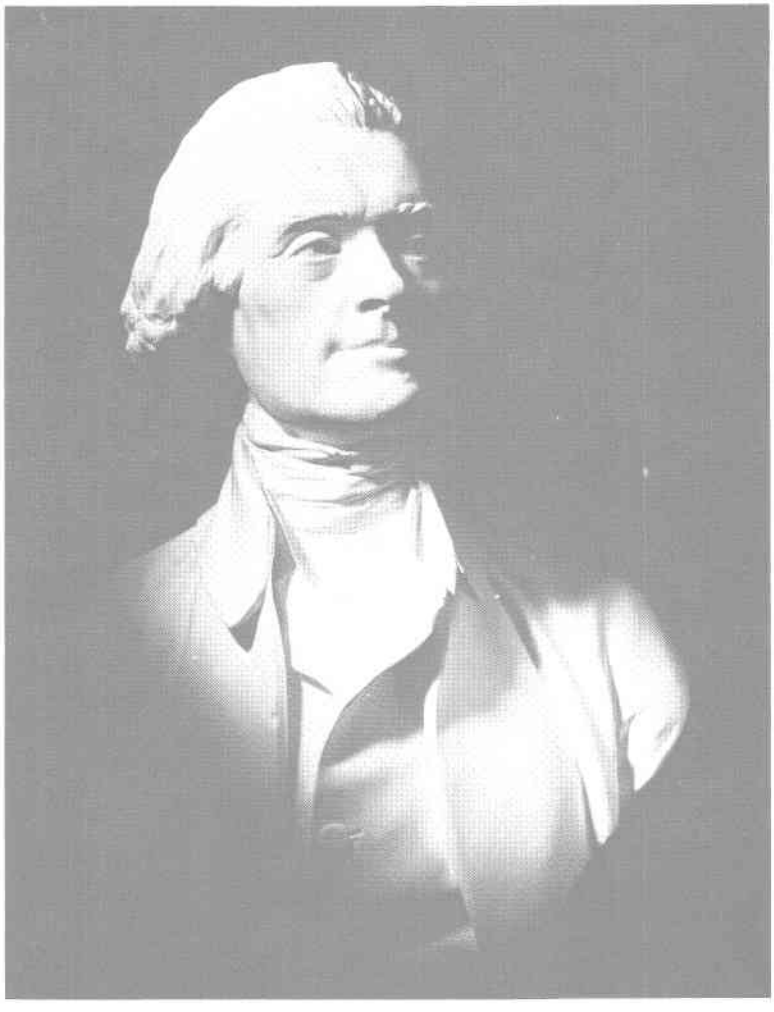

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Front Cover: Portrait bust of Thomas Jefferson. Copy of original in marble by Jean Antoine Houdon, c. 1788. (Courtesy of the Thomas Jefferson Memorial Foundation.)

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DEPARTMENT OF MINES,
MINERALS AND ENERGY

Richmond, Virginia

O. GENE DISHNER, Director

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF PURCHASE AND SUPPLY
RICHMOND

1985

Publication available from Virginia Division of Mineral Resources, Box 3667, Charlottesville, VA 22903.

Bedini, Silvio A., 1985, Thomas Jefferson and American vertebrate paleontology: Virginia Division of Mineral Resources Publication 61, 26 p.

FOREWORD

The subject of this paper was presented by the author as the Keynote Address for the Symposium on the Quaternary of Virginia held at Charlottesville in September 1984. The Symposium was one of several activities sponsored by the Virginia Division of Mineral Resources in commemoration of its 150th year. Silvio A. Bedini, for many years Assistant and Deputy Director of the National Museum of History and Technology (now the National Museum of American History), is currently Keeper of the Rare Books of the Smithsonian Institution. He has written extensively on the history and development of science in colonial America and the new republic, and he has recently completed two works, besides the present one, on the scientific pursuits of Thomas Jefferson. The Virginia Division of Mineral Resources is delighted to publish this volume, which documents the importance of Mr. Jefferson's contributions to the promotion and development of the study of vertebrate paleontology in America.

S. O. Bird
VDMR

ABSTRACT

Vertebrate paleontology was accepted among the sciences only after the publication of Georges Cuvier's major work on the subject in the early decades of the nineteenth century. Meanwhile, for almost two centuries vertebrate fossil remains had been recovered on the American continents and were being studied by English and European naturalists during the second part of the eighteenth century. These curiosities interested many in the American colonies and new republic as well, including George Washington and Benjamin Franklin and other prominent Americans. But it was Thomas Jefferson who was to have greater impact than any other American of his time on the collecting and study of fossil remains of extinct animals.

Well informed on scientific achievements and publications at home and abroad, Jefferson first became interested in fossil vertebrate remains in about 1780. For the next three decades he avidly pursued each new find, collecting and preserving fossil specimens at the cost of considerable time, effort, and personal funds. Other than the *Notes on the State of Virginia,* he authored only one scientific paper on the natural sciences. He never engaged in taxonomic study or field work, but he was primarily responsible for popularizing the subject of vertebrate paleontology and bringing it respectability.

THOMAS JEFFERSON AND AMERICAN VERTEBRATE PALEONTOLOGY

Silvio A. Bedini[1]

Thomas Jefferson has often been called the father of American vertebrate paleontology, an attribution disputed by historians from time to time because he was not the first to collect and scientifically study paleontological remains in the American colonies and new republic. Nevertheless, he was largely responsible for popularizing the subject and for preserving many specimens that otherwise would have been lost. Like most of the important men of science of his time, his endeavors were necessarily limited by his occupation, and he would have achieved considerably more had time been given to him. He was among those about whom Benjamin Smith Barton wrote, "...it is ever to be regretted that the principal cultivators of natural science, in the United States, are professional characters, who cannot without essentially injuring their best interests, devote to these subjects that sedulous attention which they demand ... in *some* respects, they are certainly better qualified to undertake, and to perform, the task than the naturalists of Europe" (Barton, 1804).

Vertebrate fossils were collected on the American continent long before Jefferson's time. The first collections were made as long as a thousand years ago by pre-Columbian Indians, and the first American fossils were seen in Europe as early as the beginning of the sixteenth century (Diaz, 1568; Ball, 1941; Simpson, 1942, p. 133-34). The earliest finds to be recorded were made in Virginia and New York State in the early seventeenth century (Warren, 1855; Goode, 1901, p. 368-69; Simpson, 1942, p. 132-35; Boyd, 1953, *Papers*, 7, p. 313-14), and the first published notice appeared in 1714 in the *Philosophical Transactions* of the Royal Society of London (Mather, 1714). American fossils discovered by the French Canadian colonist in Canada, Charles Lemoyne, Baron de Longueuil, along the Ohio River near Louisville, Kentucky in 1739 were taken to France and were the first to be studied by French naturalists (Simpson, 1942, p. 135-38). The earliest published illustration of an American fossil was a drawing of a molar of the "American mammoth" or mastodon by Jean Baptiste Guettard published in Paris (Guettard, 1752), and the first scientific consideration of American fossils formed the subject of a paper read in 1762 by the young French naturalist Louis Daubenton (Daubenton, 1762).

[1]Smithsonian Institution Libraries, Washington, D.C. 20016

In the mid-eighteenth century the great fossil repository of Big Bone Lick was discovered on the banks of the Big Bone Lick Creek in Kentucky, then one of Virginia's western territories (Jillson, 1936, p. 27-43). It was not until several decades later, however, that the first published description of the site appeared in a work by the Kentucky schoolteacher-explorer John Filson (Filson, 1784). The most famous of the early collections made from this site was assembled in about 1766 by the Philadelphia trader, George Croghan, and two years later he shipped the collection to London: part of it to Lord Shelburne and part of it to Benjamin Franklin (Featherstonhaugh, 1831; Jillson, 1936, p. 27-32). In the same period a comparable collection was formed by another Philadelphia trader, George Morgan, who turned it over for study to his brother on the faculty of medicine of the College of Philadelphia. Sketches of the specimens were made by the artist and museum entrepreneur Charles Willson Peale (Bell, 1949; Sellers, 1980, p. 10-11).

Paleontology was not yet truly a science even in Europe, but the arrival of fossils of animals still unknown from the American continent triggered the interest of British and French naturalists alike which, in turn, generated curiosity among American men of science. By the late eighteenth century the learned community of the Old World was plentifully supplied with materials for study. After viewing the fossils received by Shelburne and Franklin, the London merchant-naturalist Peter Collinson published a lengthy report on them in the *Philosophical Transactions* (Collinson, 1767). The English physiologist and anatomist Dr. William Hunter had been studying Croghan's collection and another collection housed in the Tower of London and presented his conclusions to the Royal Society in 1768; he later also published in the *Philosophical Transactions*. Comparing a lower jaw collected by Croghan with another of an elephant, Hunter concluded that they were of different species. He believed that fossil remains represented extinct species and conjectured that the bones of the Siberian mammoth would prove to be similar to those of the American *incognitum* (Hunter, 1768).

Thomas Jefferson first became concerned with vertebrate fossil remains in 1780, while governor of Virginia, as he began preparing the manuscript of his *Notes on the State of Virginia*. This modest volume, now considered to be the most important scientific and political work produced in America before the end of the eighteenth century, was begun in the summer or autumn of 1780. It was not intended for

publication but was prepared as a statistical survey in response to the French government's request for information about the nature of the country which it had assisted during the American Revolution. The request for information was transmitted to the French legate to the United States, the Chevalier de la Luzerne. The secretary of the legation, the Marquis Francois Barbe-Marbois, compiled a series of twenty-two questions which he circulated to responsible officials in each of the states. The copy of the questionnaire for Virginia was referred to Jefferson as the individual probably most knowledgeable not only about its political structure but also its geography and flora and fauna.

As Jefferson later wrote in his *Autobiography*, "I had always made it a practice whenever an opportunity occurred, of obtaining any information of our country, which might be of use to me in any station public or private, to commit to writing. These memoranda were on loose papers, bundled up without order, and difficult of recurrence when I had occasion for a particular one. I thought this a good occasion to embody their substance, which I did in the order of Mr. Marbois' queries, so as to answer his wish and to arrange them for my own use" (Jefferson, 1821). He had another reason for undertaking the project, for early in 1780 he had been elected to membership in the American Philosophical Society and a year later was elected a councilor. Uninformed of the responsibilities of the new position, he considered whether the project would qualify also as a contribution to the Society, and was assured that it would.

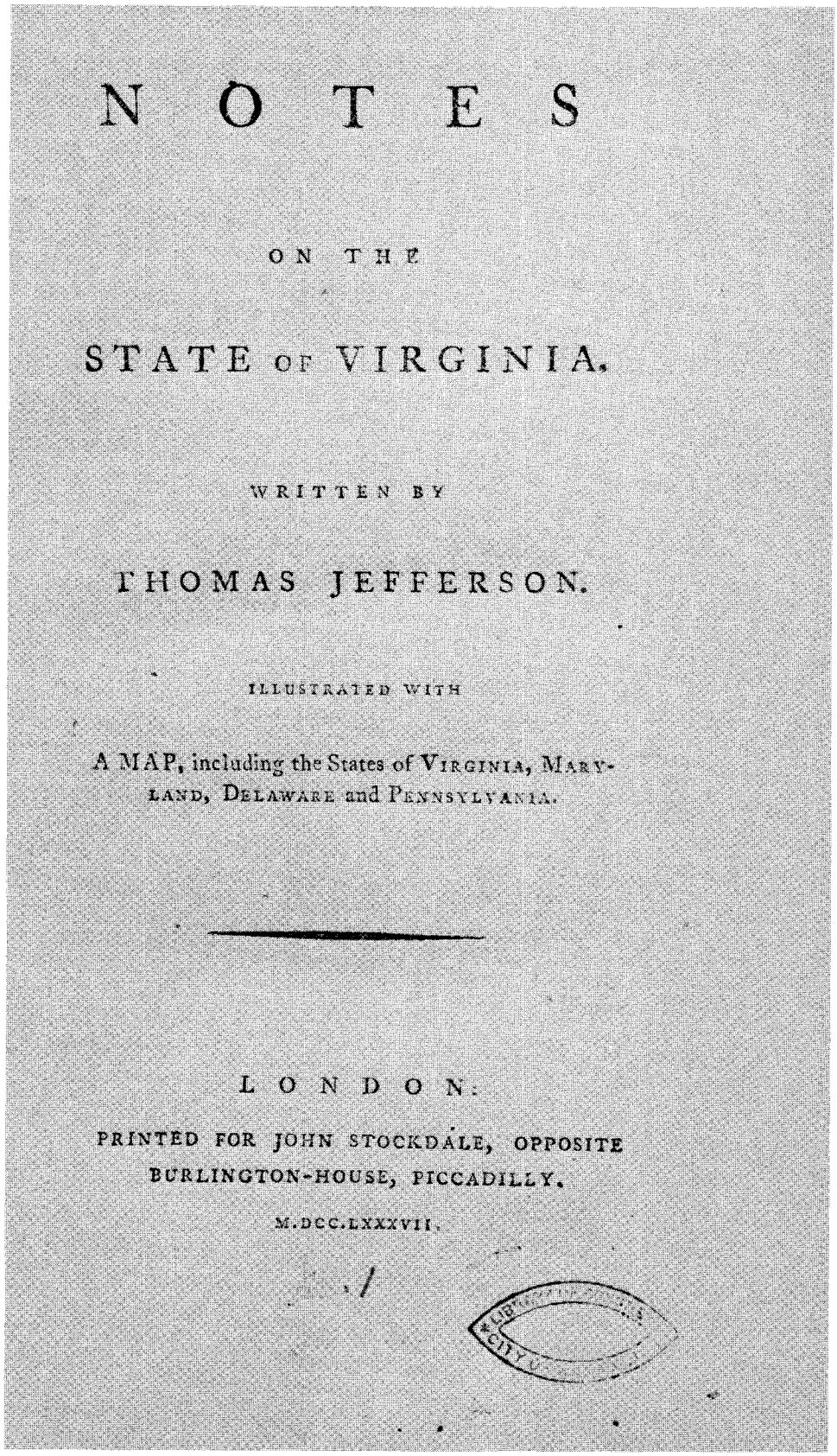
Jefferson was able to compile answers to some of the questions while governor, but it was a difficult period for him. The outcome of the American Revolution was seriously in question when the defeat at Camden was followed by Benedict Arnold's invasion of Virginia and by the capture of the state capital at Richmond. Resigning his position in June 1781, Jefferson retired to his country retreat at Poplar Forest where he completed work on the *Notes* by the end of the year. Although most of the information was collected by Jefferson at first hand, he also relied on others for additional data on subjects on which he was not well versed. He then circulated copies of his manuscript for comments, additions and corrections (O'Callaghan, 1868; Carriere, 1943-44; Verner, 1952; Boyd, 1951, *Papers*, 4, pp. 166-67).

Jefferson had not been particularly concerned at first with the subject of extinct species and fossil remains, except as part of his description of the fauna of the region. In compiling a list of animals common to both America and the Old World, he included the mammoth. When queried later why he had done so, he responded with the question why should he have not. He wrote (Jefferson, 1785, p. 53-54):

> Such is the oeconomy of nature, that no instance can be produced, of her having permitted any one race of her animals to become extinct; of her having formed any link in her great work so weak as to be broken. To add to this, the traditionary testimony of the Indians, that this animal still exists in the northern and western parts of America, would be adding the light of a taper to that of the meridian sun. Those parts still remain in their aboriginal state, unexplored and undisturbed by us, or by others for us. He may as well exist there now, as he did formerly where we find his bones.

Ever jealous of the prestige of the new republic of which he had been an architect, Jefferson in his *Notes* strongly rejected the contentions of Georges Louis LeClerc, Comte de Buffon, Europe's most distinguished naturalist. Buffon had claimed that the animals of the New World were smaller than those of the Old, that those unique to the New World were of a smaller scale, that those species that had been domesticated had degenerated, and finally, that there were fewer species of animals in the New World than in the Old. Jefferson also disputed the proposal advanced by Daubenton, Buffon's associate, that the remains of the "mammoth" that had been found were of two different species and that they belonged to either the elephant or the rhinoceros (Buffon, 1778; Jefferson, 1785, p. 45).

The *Notes on the State of Virginia* was published privately by Jefferson for distribution to friends and others he anticipated would be interested. It was later published in French and numerous editions in English followed (Figure 1). As a consequence of his research for this project, Jefferson became particularly intrigued with the subject of American fossil remains and the enigma they presented. In December 1781, shortly before the events culminating in the capture of Richmond, Jefferson corresponded with the explorer Colonel George Rogers Clark and arranged the acquisition of "some teeth of the great animal whose remains are found on the Ohio." Later, after he had resigned from the governorship and was now at home, he wrote, "This retirement into which I am withdrawing has increased my eagerness in pursuit of objects of this kind." Clark provided the statesman with numerous fossil specimens from Big Bone Lick, including "a Thigh and Jaw Bone Grinders and Tusk. The Animal had no foreteeth that I could ever discover and by no means Carnivorous as many suppose" (Boyd, 1952, *Papers*, 6, p. 139, 159-60) (Figure 2).



NOTES

ON THE

STATE OF VIRGINIA.

WRITTEN BY

THOMAS JEFFERSON.

ILLUSTRATED WITH

A MAP, including the States of VIRGINIA, MARYLAND, DELAWARE and PENNSYLVANIA.

LONDON:

PRINTED FOR JOHN STOCKDALE, OPPOSITE BURLINGTON-HOUSE, PICCADILLY.

M.DCC.LXXXVII.

Figure 1. Title page of the first English edition of *Notes On the State of Virginia* by Thomas Jefferson. (Courtesy of the Library of Congress).

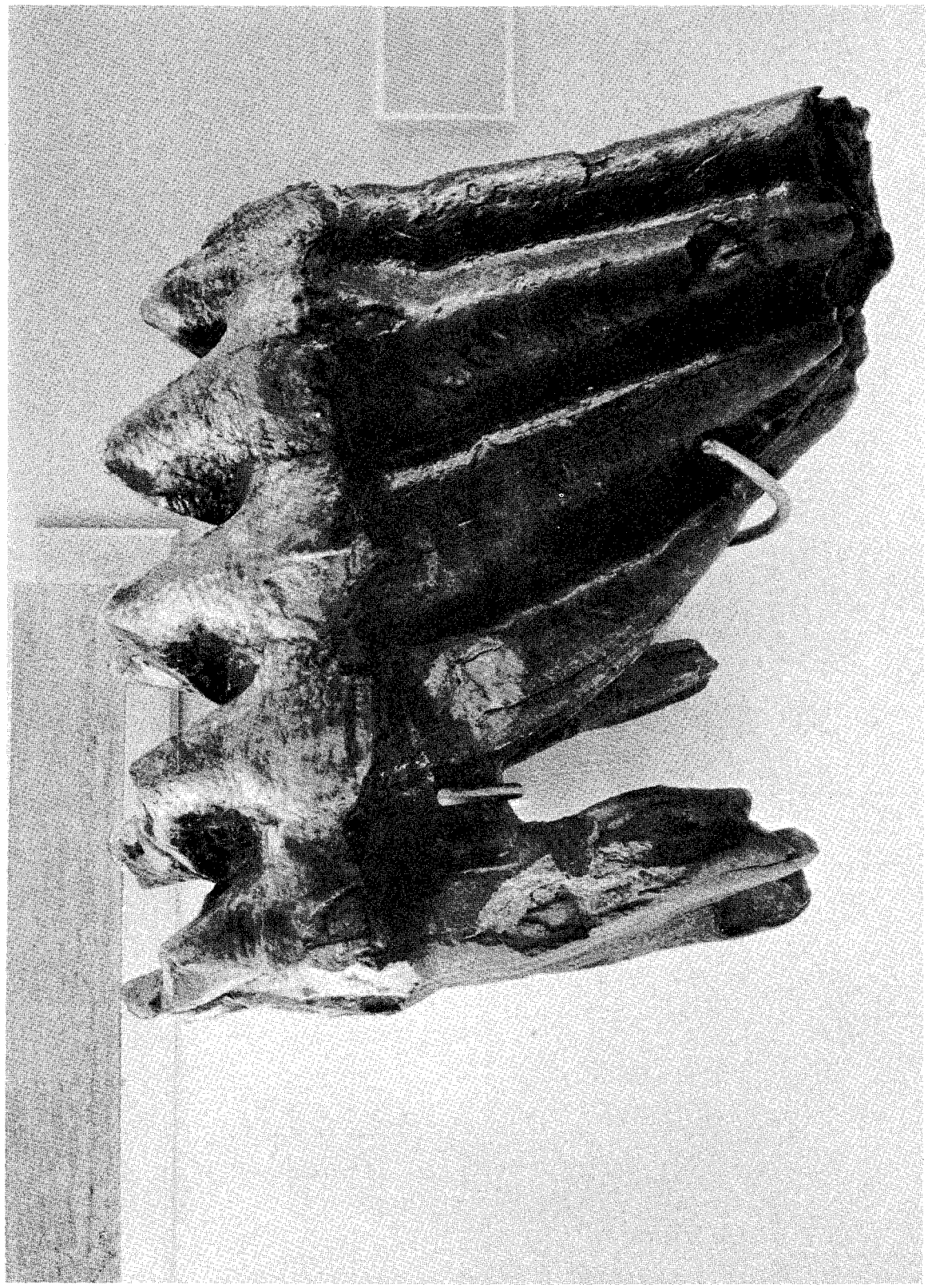


Figure 2. Tooth of *Mammut americanum* (Kerr, 1792) from Big Bone Lick. (Courtesy of the Academy of Natural Sciences of Philadelphia).

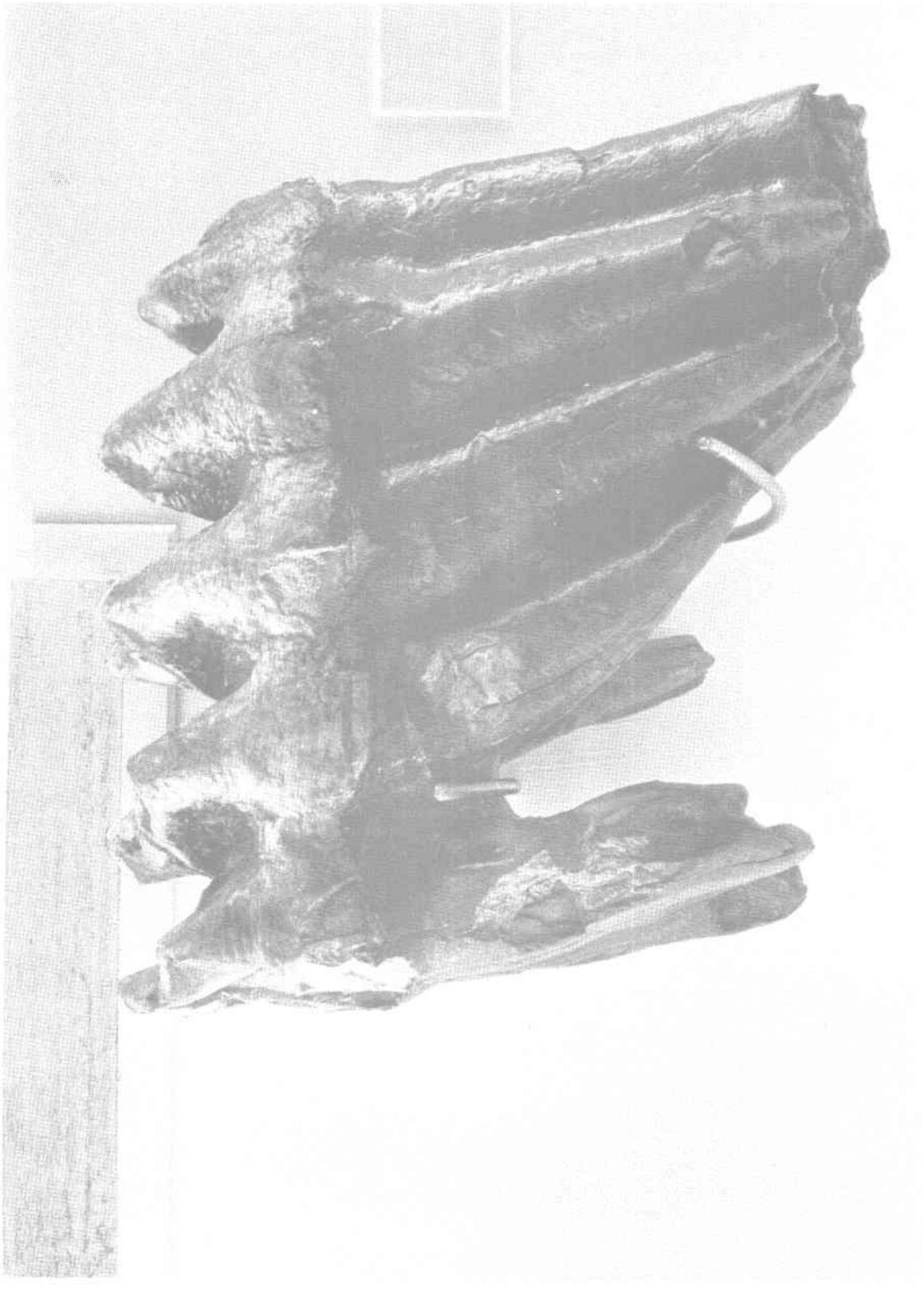


Figure 2. Tooth of *Mammut americanum* (Kerr, 1792) from Big Bone Lick. (Courtesy of the Academy of Natural Sciences of Philadelphia).

Jefferson informed himself of studies on the subject published by English and French naturalists and kept abreast of new American finds of fossil remains by means of correspondence with others who shared his interest. From the Reverend Ezra Stiles and Robert R. Livingston he learned about discoveries made in New York State (Boyd, 1953, *Papers*, 7, p. 304-5, 312-17, 364-65). In November 1782, on the eve of his departure for Paris as minister to France, Jefferson received an addition to his collection from Colonel Arthur Campbell, county lieutenant of Washington County, Virginia. This was a fossil tooth recently found by Major Alexander Outlaw, the director of the Salt Works, "at the Salina in Washington County" which is now Saltville, Virginia. Campbell reported that "Bones of an uncommon size, of which the Jaw Tooth now offered you is one" were found in pits dug in the marsh around a body of salt water (Boyd, 1952, *Papers*, 6, p. 208-9). Jefferson was familiar with the salt springs of Salinas "on the north fork of Holston" and had mentioned them in his *Notes on the State of Virginia* (Jefferson, 1785, p. 34; Ray and others, 1967). During the same period Jefferson again negotiated with George Rogers Clark for more fossils (Figure 3). He urged Clark to send him any observations he cared to make on the subject of the big bones and their history, noting "A specimen of each of the several species of bones now to be found, is to me the most desirable object in natural history" (Boyd, 1952, *Papers*, 6, p. 201, 204-5, 218-19).

Jefferson had noted that European naturalists referred to tusks and skeletons from Big Bone Lick as being those of elephants, and the molars recovered from the site as being of the hippopotamus. He was confused by these attributions and in 1785 he wrote (Jefferson, 1785, p. 44-45):

> Whenever these grinders are found there also we find the tusks and the skeleton ... It will not be said that the hippopotamus and the elephant came always to the same spot, the former to deposit his grinders, and the latter his tusks and skeleton .... We must agree then, that these remains belong to each other, that they are of one and the same animal.

Jefferson realized that a problem in identification nonetheless remained, for no known elephant had molars remotely resembling those of the hippopotamus and no hippopotamus had tusks similar to those of the elephant. What then was the mammal to which these fossil remains belonged? There was no agreement among European naturalists. Dr. Hunter had examined some of the first fossils recovered from Big Bone Lick and concluded they were remains of carnivores (Hunter, 1768). Peter Collinson, who had examined the same fossils in the same period, pronounced them to be the remains of herbivores, an extinct species of elephant (Collinson, 1767). Jefferson was inclined to accept the elephant theory at first, but then realized that no species of the elephant was known to live above the tropics (Figure 4). He contemplated whether there might have been an elephant species adapted to the cold that once lived on the American continent. If so, might it still exist in the great unexplored regions of the North American continent? He finally concluded that these remains were of a mammal resembling the elephant, but not of any of the species already known. Jefferson (1785, p.46) wrote, "I find it easier to believe that an animal may have existed, resembling the elephant in his tusks and general anatomy, while his nature in other respects was extremely different."

Jefferson continued to pursue his interest in fossil remains during the years he spent in Paris as American minister to France. He utilized every opportunity to inform himself on the sciences by visiting the Royal Cabinet of Natural History and other collections formed by amateurs. He became personally acquainted with Buffon and Daubenton as well as with several of the younger naturalists, including Faujas de Saint-Frond, Andre Thouin, and Bernard Delaville, Comte de Lacepede, continuing his association with the younger scientists after his return to the United States (Rice, 1951, p. 597-99).

He corresponded widely at home and abroad on the subject, and investigated every new find. When Louis, Prince of Parma of the Spanish royal family, wrote to him seeking a correspondent in the United States on scientific subjects, he referred him to Charles Willson Peale, and sent him a tooth "of the great animal called mammoth," recovered from the interior of the United States (Lipscomb and Bergh, 1903, *Writings*, 19, p. 115-19; Ford, 1892-99, *Writings*, 4, p. 102-6). He sent a copy of his *Notes* to Buffon, as he reported to his Dutch correspondent Hogendorp, but had not yet met with him because the naturalist was spending the summer out of the city. In his response to Jefferson, Buffon still contended that the elephant and the mammoth were one and the same (Boyd, 1953, *Papers*, 8, p. 631-34).

In his *Notes* Jefferson had demonstrated not only unusual knowledge of the subject but considerable courage as well in refuting Buffon's view that the mammals of the Old World had degenerated in the American climate where the heat was less and the humidity greater (Jefferson, 1785, p. 47-49; Henline, 1947). He illustrated his position concerning the size of American animals most convincingly in 1787 by obtaining from American friends in Vermont the skeleton and skin of a large moose and the horns of

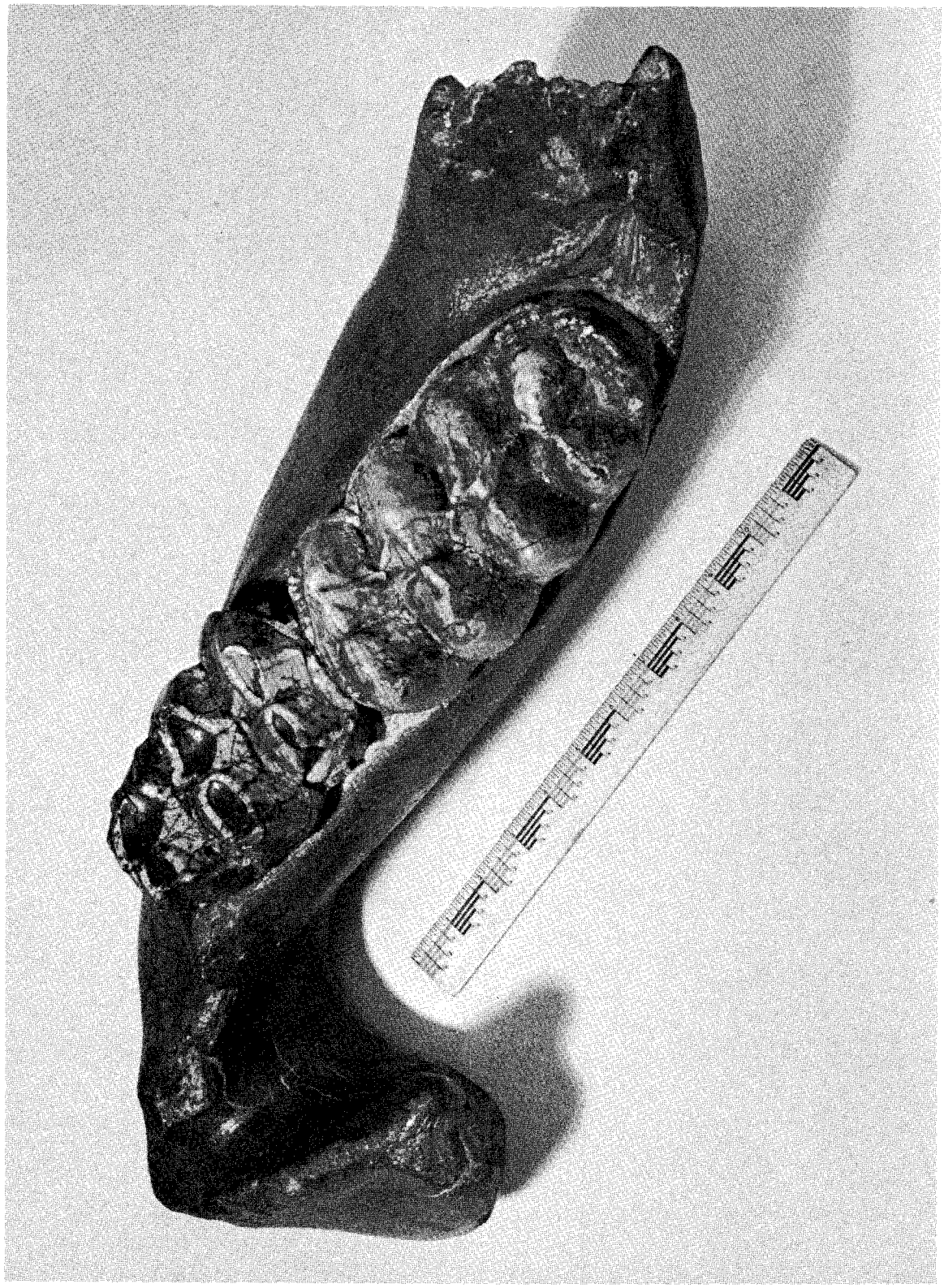


Figure 3. Jawbone of *Mammut americanum* (Kerr, 1792) procured for Jefferson by William Clark from Big Bone Lick. (Courtesy of the Academy of Natural Sciences of Philadelphia).

Figure 3. Jawbone of *Mammut americanum* (Kerr, 1792) procured for Jefferson by William Clark from Big Bone Lick. (Courtesy of the Academy of Natural Sciences of Philadelphia).

Figure 4. Symbos cavifrons (Leidy, 1852). Metacarpal bone, probably of a bison. Incorrectly labeled as *Ovibus cavifrons*. If the specimen is indeed from a musk ox, it represents one of the extinct species. (Courtesy of the Academy of Natural Sciences of Philadelphia).

Figure 4. Symbos cavifrons (Leidy, 1852). Metacarpal bone, probably of a bison. Incorrectly labeled as *Ovibus cavifrons*. If the specimen is indeed from a musk ox, it represents one of the extinct species. (Courtesy of the Academy of Natural Sciences of Philadelphia).

caribou, elk, and deer. These he had shipped to France at considerable expense as proof of his contention. He believed that he had convinced Buffon of some of his errors, and the French naturalist had in fact promised to make some corrections in his next volume. However, he died before he was able to do so (Boyd, 1955, *Papers*, vol. 12, p. 287-88).

Jefferson avoided becoming involved with the theory of evolution voiced by Buffon, and in fact was opposed in principle to formulating theories upon insufficient evidence. Instead, as he wrote to Charles Thomson in 1787 about western archeological antiquities (Boyd, 1955, *Papers*, vol. 12, p. 159):

> I wish that the persons that go tither [the western country] woud make very exact decriptions of what they see of that kind, without forming any theories. The moment a person forms a theory, his imagination sees, in every object, only the traits which favor that theory. But it is too early to form theories on those antiquities. We must wait with patience till more facts are collected.

Jefferson was particularly interested in Indian legends relating to prehistoric beasts. It was well known to the Indians that tusks, grinders, and skeletons of ancient beasts abounded along the Ohio River and in many northern regions. In his *Notes* he had commented that the American mammoth, or "big buffalo" as the Indians called it, was the largest of all mammals, that it was carnivorous, and that it still survived in the northern part of the continent, as Indian tradition claimed. He wrote that while he was governor of Virginia a delegation of Indians that visited him informed him of a tradition handed down in the tribes. It related that in ancient times a herd of these tremendous animals had come to Big Bone Lick. There they began the destruction of all other animals, including bears, deer, elk, and buffalo. When the Great Man in the sky observed this wholesale slaughter, he was enraged and descending to the earth, he hurled lightning bolts among the predators until only one remained. This great bull although wounded fled to an area beyond the Great Lakes where it survives to the present. Its voice could sometimes still be heard (Jefferson, 1785, p. 43).

Reports of great unknown beasts still roaming the wilderness continued to come to Jefferson from various sources. A decade later the former scout and Indian fighter John Stuart sent him an account related by two other scouts, George Wilson and John Davis (Preston, 1973, p. 6). Stuart wrote:

> They were living on cheat river some time in the year 1765 in the nighttime something approached their Camp with astonishing roaring and very much allarmed them, their dogs also srunk & lay down at their feet refuseing to bark, as it drew nerer its cry became in their opinion as loud as thunder, and the stomping seemed to make the ground shake, the darkness of the night prevented their seeing their enemy tho they stood long with their arms to defend themselves, they hoped to see its tracks in the morning, but in this they were disappointed, not a sign was to be found....

Jefferson was intrigued with every new report of discoveries of fossil remains, particularly of other unknown animals. Following his term as Secretary of State, he retired to Monticello for a period of rest prior to assuming his new role as Vice President of the United States. It was during this period that Stuart wrote to him describing some bones of a "Tremendous animal of the clawed kind lately found by some saltpetre manufacturers." These had been discovered in a cave a short distance from Stuart's home in Greenbrier County, Virginia. Stuart noted also that the find included "other Bones of Human Creatures ... of a surprizing size & uncommon kind." Stuart sent the bones on to Jefferson, who confirmed that they appeared to be of a species hitherto unknown. He sought other remains and Stuart reported that some had been dispersed but complied by sending him all remaining bones that had been recovered at the site (Figure 5). They consisted of part of a femur, a broken ulna, a radius, three claws, and several bones of the feet (Preston, 1973, p. 6-11).

Jefferson planned to donate this exciting new find to the American Philosophical Society, and to prepare a paper on the subject for publication. Before doing so, however, he sought a thigh bone so that the stature of the mammal could be estimated. "I cannot however help believing," he wrote to Stuart, "that this animal as well as the Mammoth are still existing. The annihiliation of any species of existence is so unexampled in any parts of the economy of nature which we see, that the probabilities against such annihiliation are stronger than those for it" (Preston, 1973, p. 9-10). A thigh bone had in fact been found but was mislaid and lost.

Jefferson arranged membership in the Society for Stuart in acknowledgement of his find, and then set to work to prepare a paper to be read before its members. He hoped that it in time would be included in the new volume of the *Transactions* then being

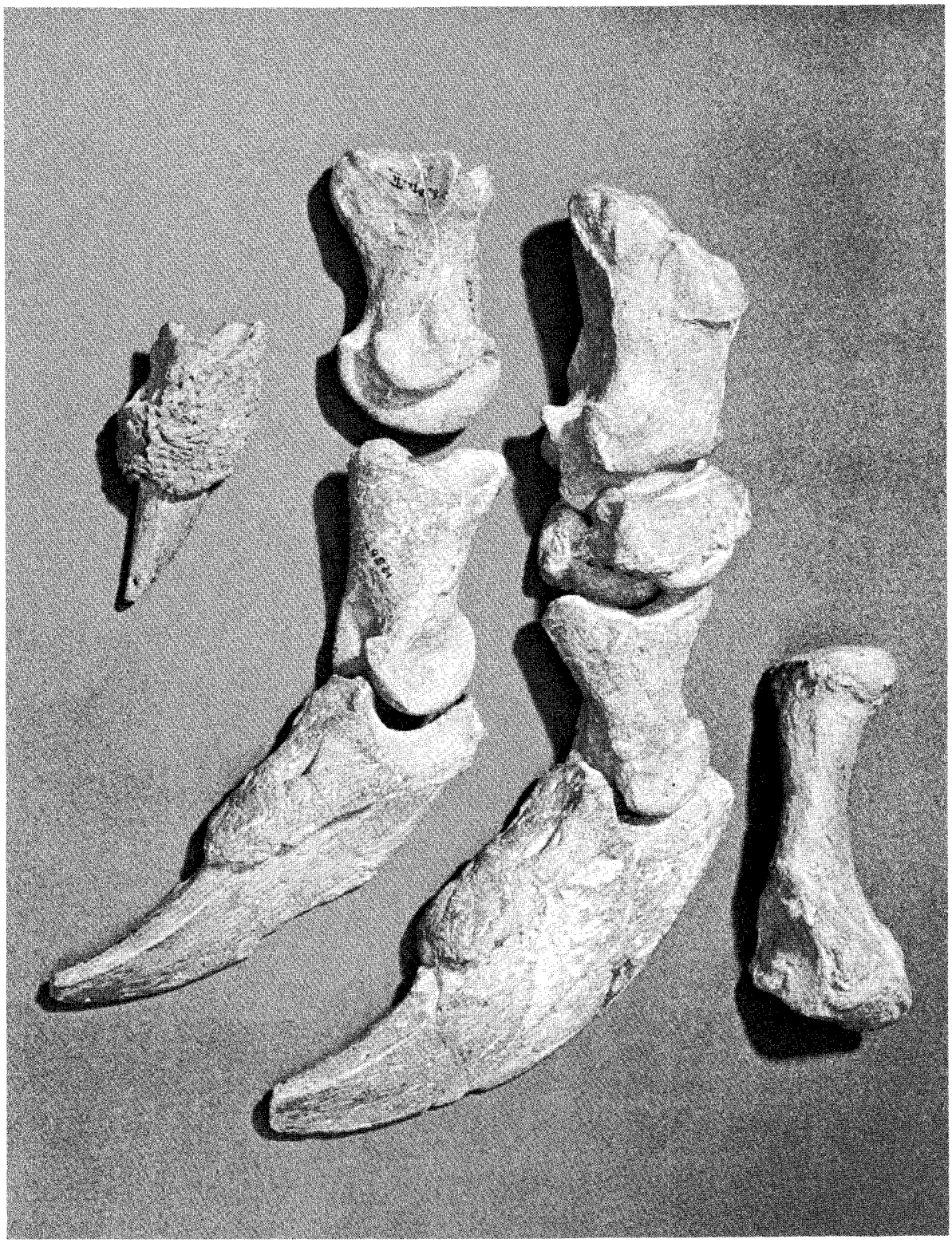


Figure 5. Unguals, phalanges, and metacarpals of *Megalonyx jeffersoni* (Desmarest, 1822) found in West Virginia. (Courtesy of the Academy of Natural Sciences of Philadelphia).

Figure 5. Unguals, phalanges, and metacarpals of *Megalonyx jeffersoni* (Desmarest, 1822) found in West Virginia. (Courtesy of the Academy of Natural Sciences of Philadelphia).

prepared for publication (Osborn, 1929, p. 411; Osborn, 1935, p. 537; Boyd, 1958, p. 422-23). He named the mammal "the Great Claw" or *Megalonyx* and classified it as a predator. He compared it to a lion, the largest clawed animal of which he knew, and concluded that they were of the same species. Based upon a comparison of bones, he estimated that the unknown mammal had been more than five feet in length and had weighed slightly more than eight hundred pounds. He also concluded that it still existed inasmuch as its remains had been found (Osborn, 1935, p. 537; Jefferson, 1799, p. 255-56). He wrote:

> In the present interior of our continent there is surely space and range enough for elephants and lions, if in that climate they could subsist; and for mammoths and megalonyxes who may subsist there. Our entire ignorance of the immense country to the West and North-west, and of its contents, does not authorize us to say what it does not contain... In fine, the bones exist: therefore the animal has existed. The movements of nature are in a never-ending circle. The animal species which has once been put into a train of motion, is still probably moving in that train. For, if one link in nature's chain might be lost, another and another might be lost, till this whole system of things should vanish by piecemeal...."

At the beginning of March 1797 Jefferson traveled in his carriage from Monticello to Philadelphia to assume office not only as Vice President of the United States, but also as president of the American Philosophical Society. Carefully packed at his feet were the bones of the *Megalonyx* and he also had brought with him the paper to be presented at the Society. In accordance with his usual custom after arrival in a city, he browsed through the bookstores. Quite by chance he happened upon a copy of the September 1796 issue of the British *Monthly Magazine*. To his astonishment therein he found an engraving of the skeleton of a great clawed animal discovered in Paraguay which had been added to the royal cabinet of natural history in Madrid. The accompanying article was based upon a pamphlet by the French naturalist Georges Cuvier, in which he named the mammal *Megatherium* and classified it among the edentates as a relative of the sloth (Preston, 1973, p. 10-11; Boyd, 1958, 14, p. 425-32).

With remarkable perspicacity Jefferson realized that his original identification of *Megalonyx* as a member of the cat family was probably in error. He quickly revised his paper, deleting sections and adding a supplement before submitting it to the Society. He alluded to the article in the British journal, cautiously noting that it was only an abstract, and that the representation of the skeleton might not be totally reliable. Positive identification, he stated, should be left for future study (Jefferson, 1799, p. 259-60). It is ironic that lying forgotten in his own library at Monticello was a drawing of the same *Megatherium* skeleton with its exact dimensions. It had been sent to him eight years previously by William Carmichael, Charge d'Affaires at Madrid. Jefferson had acknowledged receipt of the drawing, filed it, and then totally forgotten it. Had he remembered the drawing, he would have had the honor of preceding the Spanish naturalists and Cuvier in identifying and naming it (Boyd, 1958, *Papers*, 14, pp. xxv-xxxiv, 504-5; Boyd, 1958, pp. 433-34).

In the final version of his paper as later published in the *Transactions*, Jefferson left in question the relationship of *Megalonyx* and *Megatherium*, but he nonetheless kept open the possibility that the former might, after all, be a member of the cat family (Figure 6). An article by the anatomist Caspar Wistar in the same issue of the *Transactions* concluded that *Megalonyx* was related to *Bradypus* or sloth illustrated in Buffon's *Natural History*, and in some respects to *Megatherium*, but it was not the same species as either (Wistar, 1799, p. 530-31). Although a good comparative anatomist, Wistar was not a practising taxonomist. Nonetheless he had made a thorough study of Jefferson's *Megalonyx*.

In memoirs on *Megalonyx* and *Megatherium* published in 1804, Cuvier credited Jefferson as the discoverer of the former (Cuvier, 1804-5, p. 358-76). In 1822 the French naturalist Anselme Desmarest named the Virginia *incognitum, Megalonyx jeffersoni*, as it is known today (Desmarest, 1822). Jefferson's publication on the subject was his sole venture into scientific writing relating to paleontology.

The American Philosophical Society's involvement with *Megalonyx* evoked such interest in its membership that it established a special committee to promote research on American antiquities and natural history. It urged the importance of acquiring one or more skeletons of the American mammoth and any other American unknown animals previously discovered or yet to be discovered. Particularly it directed attention to discoveries already made at Big Bone Lick and also in Orange and Ulster counties in New York State (Phillips, 1885, p. 258).

Having learned of the recovery of some large bones in New York State, and encouraged by the Society's interest, Jefferson was eager to acquire some for the Society's collection. He wrote to Livingston who lived near the site, asking him to determine whether the bones were indeed of the mammoth and whether some

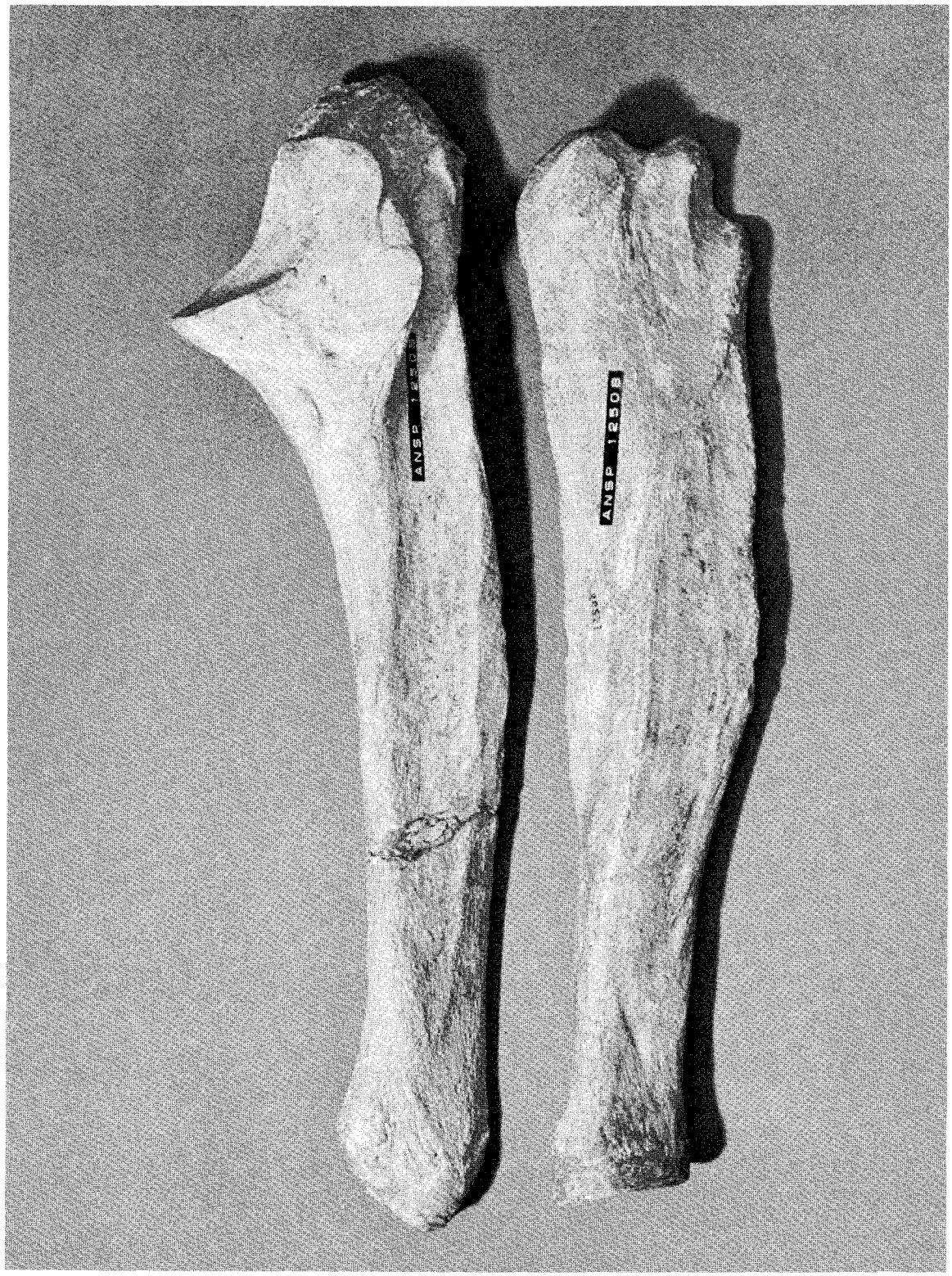


Figure 6. Radius (right) and ulna (left) of the *Megalonyx jeffersoni* (Desmarest, 1822). (Courtesy of the Academy of Natural Sciences of Philadelphia).

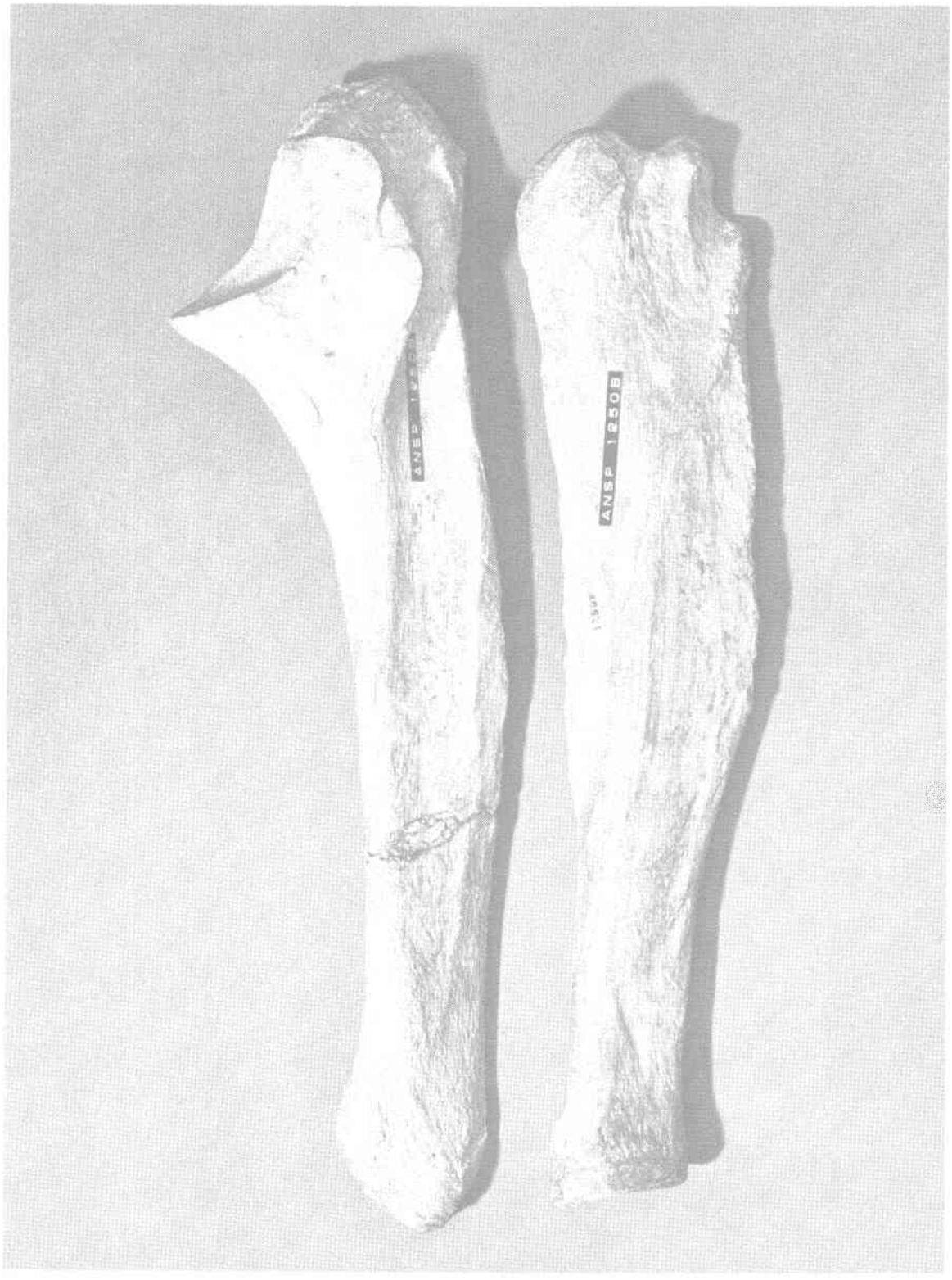


Figure 6. Radius (right) and ulna (left) of the *Megalonyx jeffersoni* (Desmarest, 1822). (Courtesy of the Academy of Natural Sciences of Philadelphia).

would be available. Livingston reported that the bones had been found in Shawangunk in Ulster County and that they had been declared common property so that none could be removed until the excavation had been completed. Jefferson then wrote to Wistar requesting him to prepare a list of bones particularly desired for the Society's collection so that they could be requested from Shawangunk (Osborn, 1935, p. 535).

Peale, meanwhile, had become vitally interested in fossil remains since the time that he had sketched examples in the Morgan find. He visualized the benefits to science as well as financial benefits to his Museum to be derived from acquiring and displaying a full skeleton of the "American mammoth," and set about to achieve it. Within the next year he succeeded in acquiring not one but two skeletons. One of these he assembled and exhibited in the Museum, and the other was taken by several of his sons on tour in England and the Continent (Sellers, 1980, p. 123-58).

While Peale was busy excavating and assembling his mammoth skeletons, Jefferson with the assistance of others continued his search for new evidence and remains of unknown or extinct animals. It was while he was deeply engaged in these concerns that Jefferson convinced the Congress to authorize an expedition to seek the headwaters of the Missouri River, which was led in 1803 by Captains Meriwether Lewis and William Clark (Thwaites, 1904-5, vol. 7, p. 206-9; Jackson, 1962, p. 10-14). The explorers visited Big Bone Lick and Lewis reported extensively on what they saw. He forwarded specimens to Jefferson but they went astray and were lost (Jackson, 1962, p. 126-32). Lewis was reported also to have found "*Baculites, Gryphaea* and other marl fossils at the Great Bend of the Missouri River" (Morton, 1834, p. 25). Although the expedition recorded many natural phenomena and returned with valuable collections of natural history materials, only one vertebrate fossil was returned, or at least has survived (Figure 7). This was part of the jawbone of a prehistoric fish, *Saurocephalus lanciformis,* found by Lewis in 1804 "in a cavern a few miles distant from the Missouri. S. side of the river" (Harlan, 1834; Hays, 1830; Gillette and Shapiro, 1978). In their journals Lewis and Clark recorded several other fossils observed during the expedition, including "the back bone of a fish, 45 feet long tapering to the tale, Some teeth & those joints were Seperated and all Petrefied" (Thwaites, 1904-5, vol. 1, p. 144) Two years later Clark noted in his journal that he "employed my self in getting pieces of the rib of a fish which was Semented within the face of the rock this rib is *(about 3)* inches in Secumpherence about the middle it is 3 feet in length tho a part of the end appears to have been broken off (*the fallen rock is near the water — the face of the rock where rib is perpend.r* [perpendicular] — *4i.s* [inches] *lengthwise, a little barb projects*" (Thwaites, 1904-5, vol. 5, p. 294).

Preoccupied still with building the Society's fossil collection, Jefferson pursued other potential finds. He wrote to David Ross, proprietor of Big Bone Lick, requesting permission to hunt for particular bones for the Society's collections, and prevailed upon Wistar to prepare another list of desired remains. Dr. William Goforth, who had accumulated a collection from the site earlier, offered to search for more fossil remains, but instead Jefferson commissioned William Clark to do so at his own personal expense the next time he went through the region. Clark hired ten laborers and superintended their excavation for several weeks, succeeding in collecting more than three hundred fossil remains. These he shipped in three large boxes to Jefferson at the White House (Figure 8). The collection proved to contain some valuable specimens, which Jefferson described to Wistar. These included, "1st, of the Mammoth, as he calls it, frontals, jaw-bones, tusks, teeth, ribs; a thigh, and a leg, and some bones of the paw; 2nd, of what he calls the Elephant, a jaw-bone, tusks, teeth, ribs; 3rd, of something of the Buffalo species, a head and some other bones unknown... But the great part of the collection are mere duplicates of what you possess in Philadelphia, of which I would wish to make a donation to the National Institute of France...." (Osborn, 1935, p. 535-36; Jillson, 1936, p. 51; Simpson, 1942, p. 156-57; Rice, 1951, p. 599-607).

Delighted with Clark's shipment, Jefferson invited Wistar to come to Washington to study the fossils and make a selection for the Society (Figure 9). The President had spread the bones out in a large unused and unfurnished room in the White House in which he maintained other personal collections. This room, which served as what may be considered to have been the first paleontological laboratory in the country, had previously been used by Abigail Adams as a laundry drying room. It remained unused except for storage after Jefferson's tenure until the Jackson administration, and it is now the elegant East Room of the White House. Jefferson and Wistar worked together identifying the specimens, and selecting the best for the Society (Figures 10-12). Jefferson chose a few of the fossils for Monticello, and arranged to send the remainder to the Institute of France. He wrote to Lacepede offering the fossils, stating that he recalled that the remains of the *animal incognitum,* sometimes called the American mammoth, from the Ohio River preserved in the Cabinet of Natural History was incomplete. These specimens proved to be of great value to the French naturalists in determining that the animal had been neither an elephant nor a mammoth but an entirely different mammal and that in all probability it was arborivorous. From the gift of

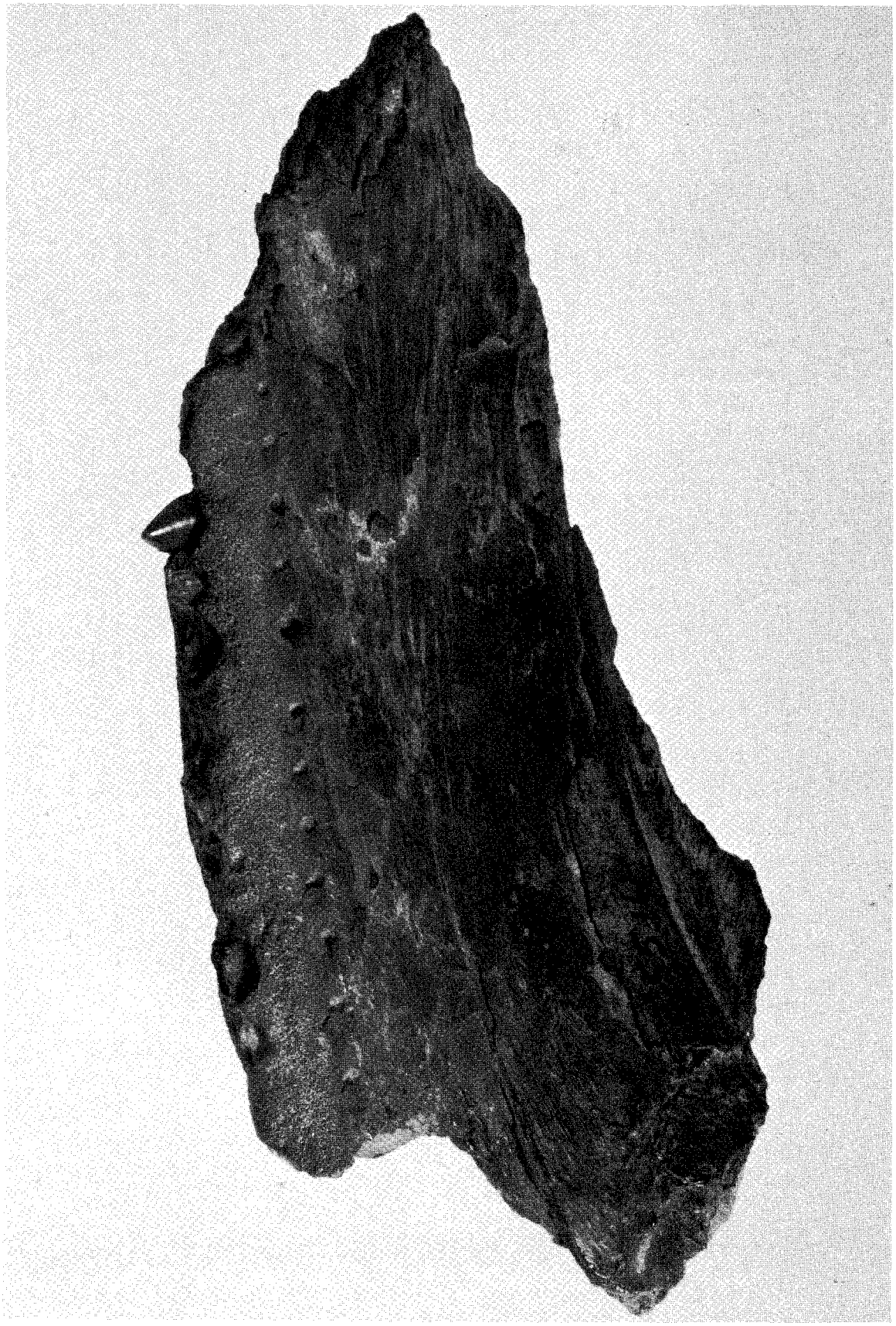


Figure 7. Part of the jawbone of the prehistoric fish *Saurocephalus lanciformis* (Harlan, 1824), found by Meriwether Lewis in a cave near the Missouri River. (Courtesy of the Academy of Natural Sciences of Philadelphia).

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Figure 8. Holotype cranium of *Bootherium bombifrons* (Harlan, 1825), an extinct musk ox, collected by William Clark for Jefferson. It retains most of the horn cores but the facial and palatal bones are lacking. Anterior is toward viewer. (Courtesy of the Academy of Natural Sciences of Philadelphia).

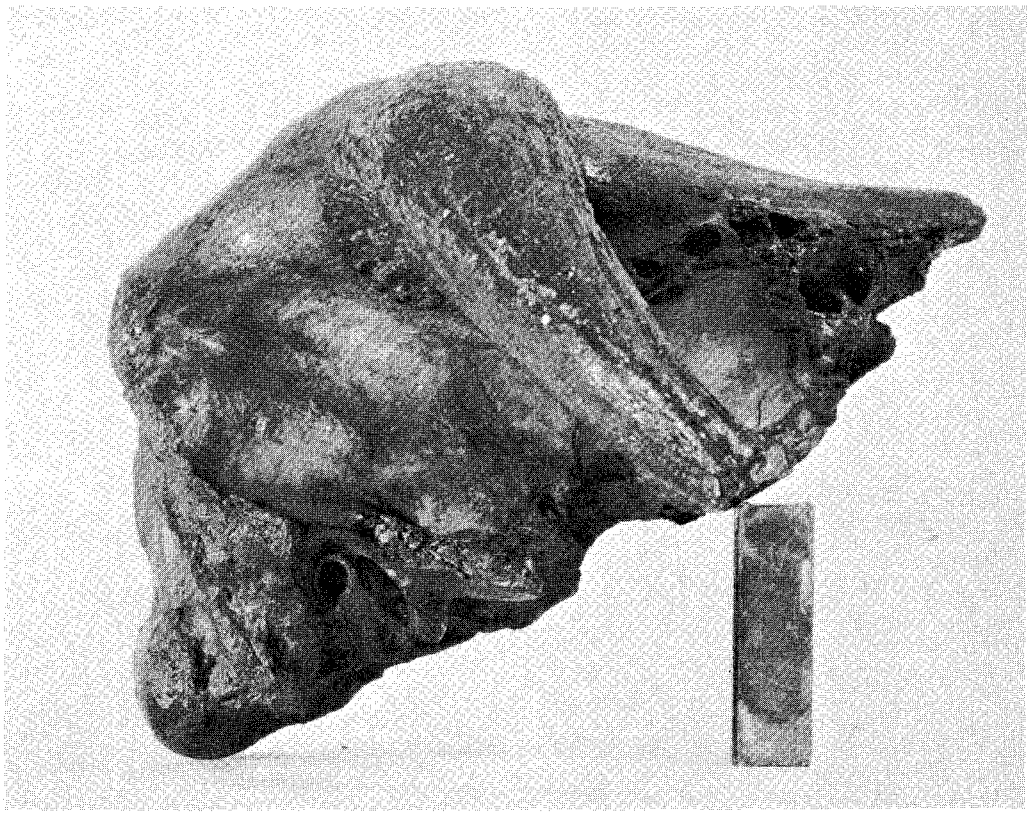
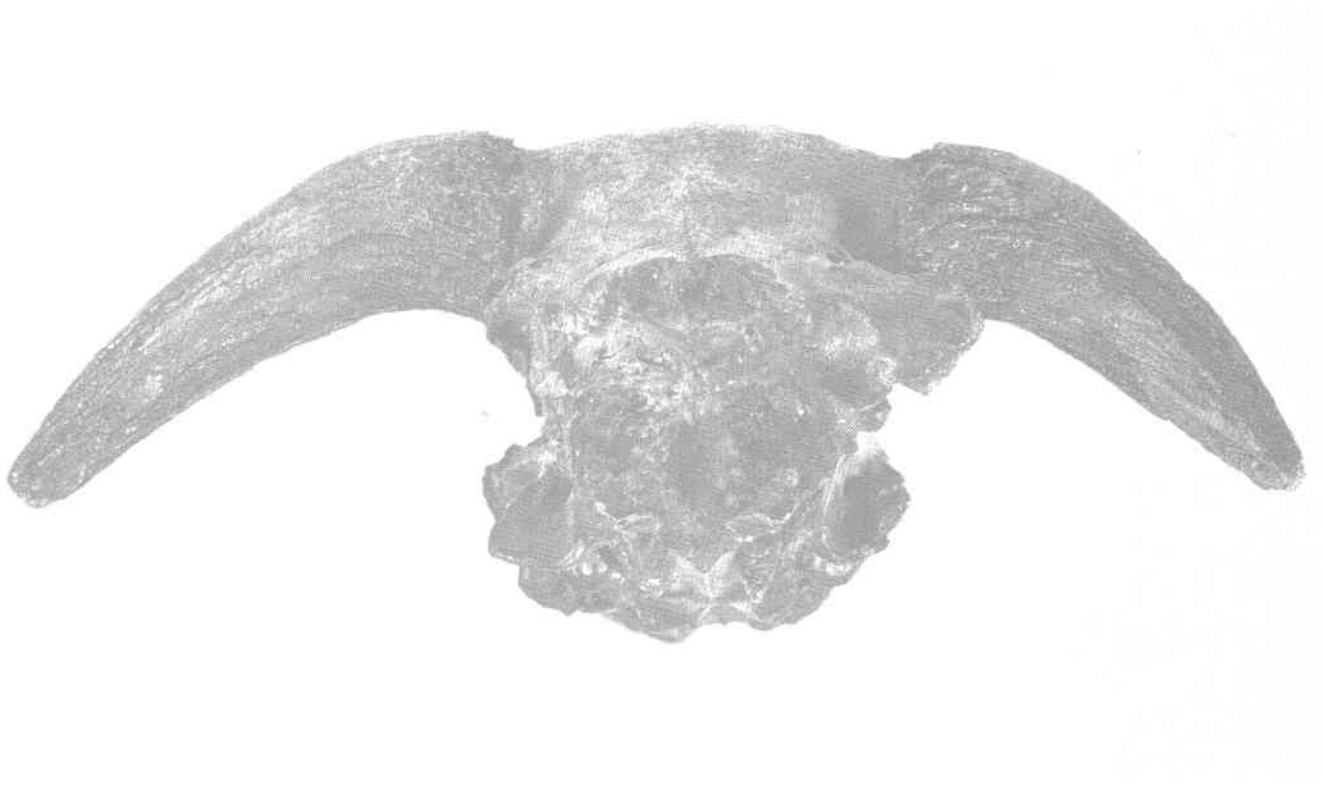


Figure 9. Right lateral view of *Bootherium bombifrons* (Harlan, 1825) shown in Figure 8. (Courtesy of the Academy of Natural Sciences of Philadelphia).



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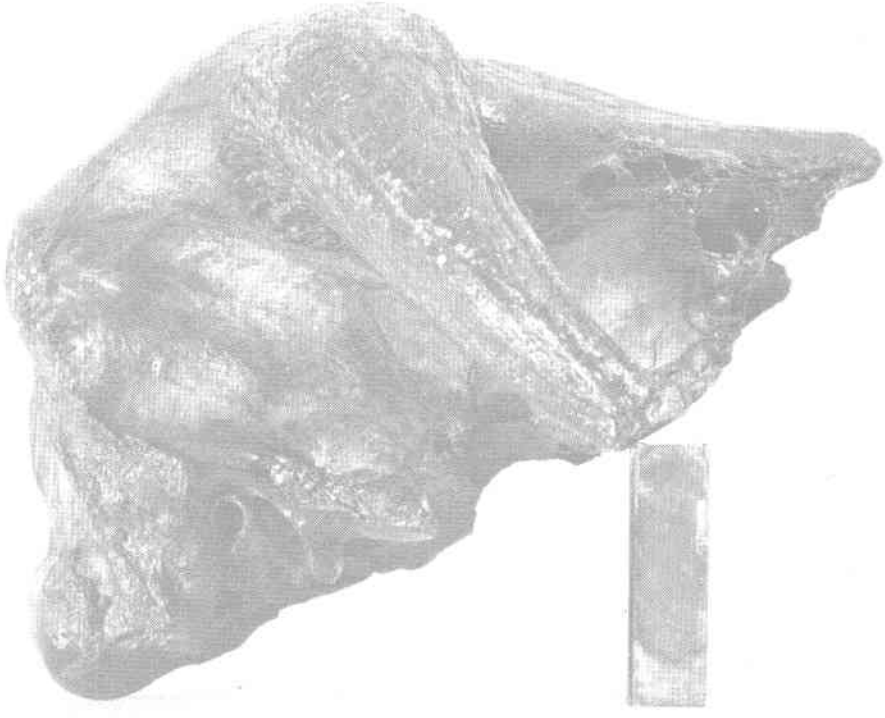

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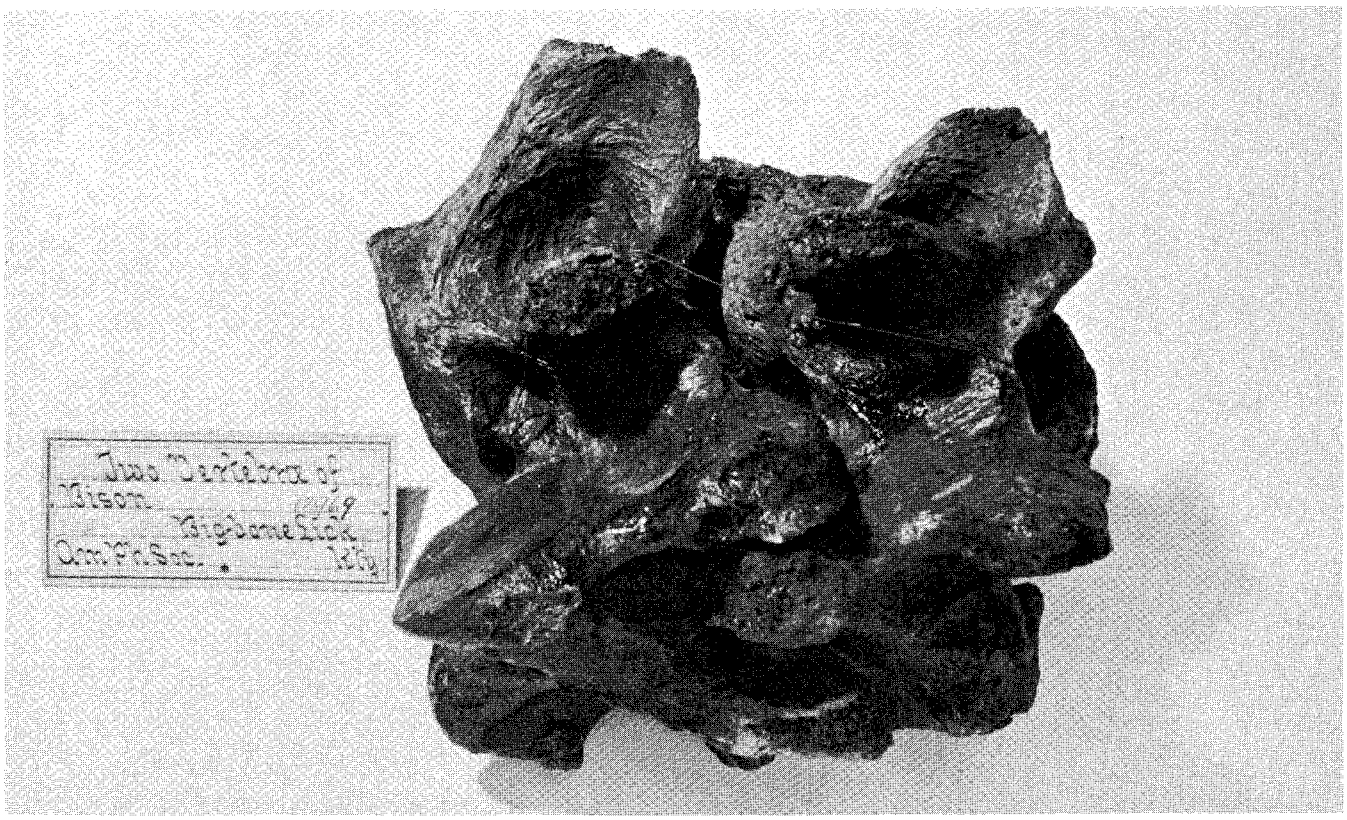

Figure 10. Two vertebrae of a bison from Big Bone Lick. May have been among the specimens acquired by Clark for Jefferson. (Courtesy of the Academy of Natural Sciences of Philadelphia).

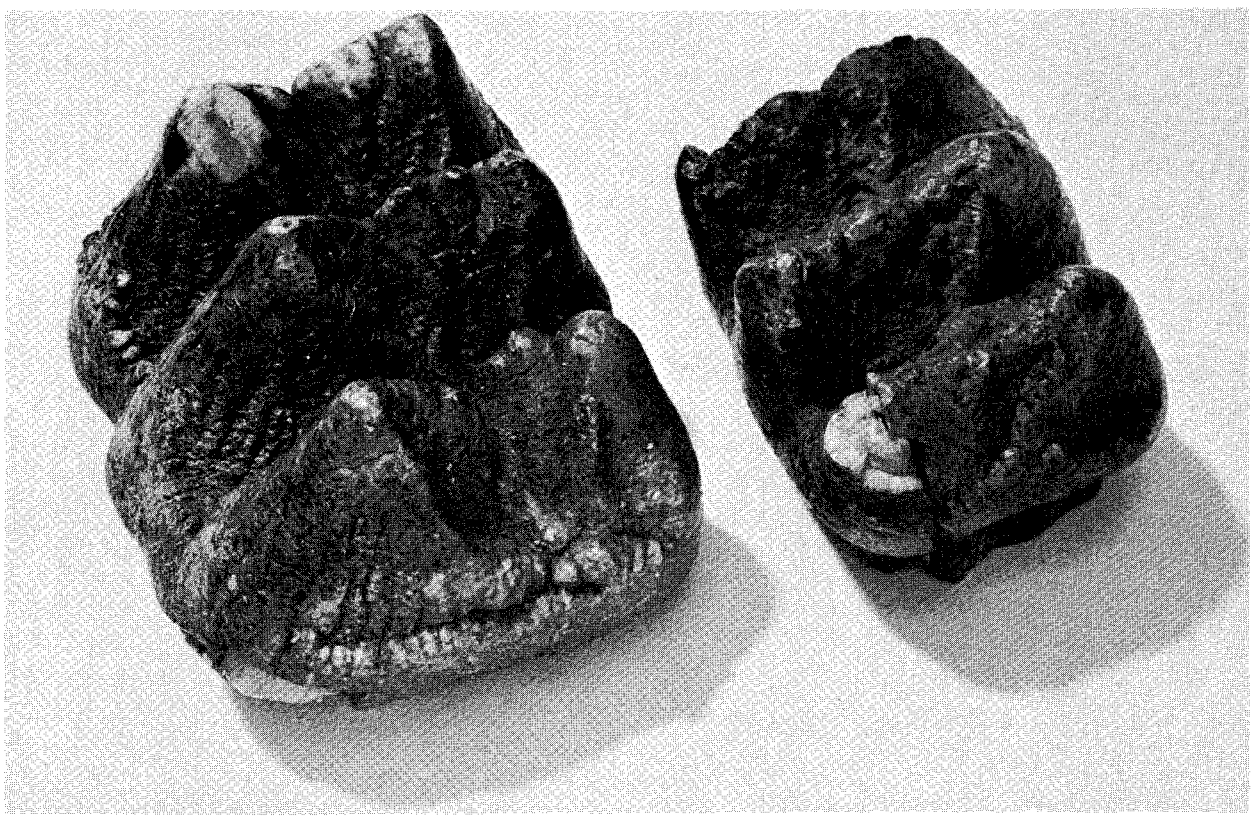

Figure 11. Teeth of *Mammut americanum* (Kerr, 1792) from Big Bone Lick. (Courtesy of the Academy of Natural Sciences of Philadelphia).

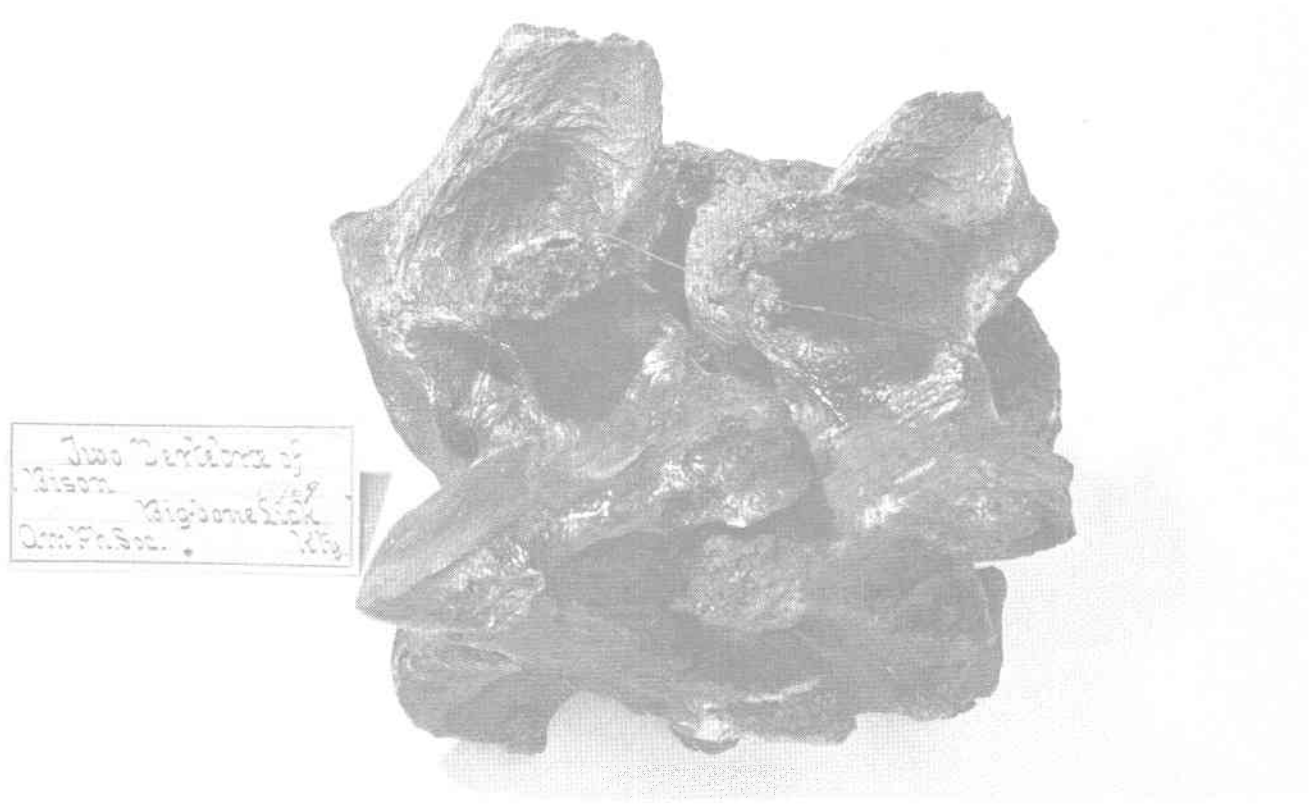

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Figure 12. Jawbone of *Mammut americanum* (Kerr, 1792). (Courtesy of the Academy of Natural Sciences of Philadelphia).

Figure 12. Jawbone of *Mammut americanum* (Kerr, 1792). (Courtesy of the Academy of Natural Sciences of Philadelphia).

fossils Cuvier was enabled to "reconstruct" two extinct species, *Mastodon americanus* and *Elephas primigenius*, which he mentioned for the first time in the second edition of his *Recherches* published in 1821 (Rice, 1951, p. 610-19; Cuvier, 1821, I, p. 155-56).

Despite the burdens of public office, nonetheless found time for his scientific endeavors, even when the Congress was attempting to resolve the confusion resulting from the tie in the voting for the presidency which forced the House of Representatives to break the tie. However, he was severely criticized again and again for his scientific pursuits. This was partly because of the fact that in his time many equated science with atheism. Five years later his Embargo Act to prevent American ships from engaging in foreign commerce brought him denunciation from all sides, and once again his critics used his scientific interests to his detriment. The poet William Cullen Bryant, then only thirteen years of age, wrote the poem "The Embargo", later suppressed, attacking Jefferson for his interests (Bryant, 1809):

> Go, wretch, resign thy presidential chair,
> Disclose thy secret measures, foul or fair,
> Go search with curious eyes for horned frogs,
> 'Mid the wild wastes of Louisiana bogs;
> Or where the Ohio rolls his turbid stream
> Dig for huge bones, thy glory and thy theme.

Although he was annoyed by the attacks from the press and the pulpit because of his search for knowledge, he was not intimidated by them. "Of all the charges brought against me by my political adversaries," he wrote to Charles F. Welles in 1809, "that of possessing some science has probably done them the least credit. Our countrymen are too enlightened themselves to believe that ignorance is the best qualification for their service" (Boyd, 1958, *Papers*, 14, p. 435).

William Clark continued to collect fossils for Jefferson in the last year of his presidency and shipped another great accumulation from Big Bone Lick. The shipment arrived safely in New Orleans, but when the vessel put into Havana, it was condemned as unseaworthy and the fate of the fossils remained unknown. Following Jefferson's retirement from public office for the last time in 1809, and after he had settled in at Monticello, his preoccupation with fossil remains began to diminish and was gradually replaced by another enthusiasm, the building of the University of Virginia. For the remaining seventeen years of his life he directed his efforts chiefly to the planning and construction of the University (Bruce, 1920, 1, *passim*, Patton and others, 1915, pp. 7-31; Malone, 1981, pp. xvi, 142, 168, 274-282, 376-80, 397-423). Little by little he withdrew from scientific pursuits as his involvement with the University increased. In 1811 when the Polish historian and archeologist Count Jan Potocki wrote to request information about the American continent, to which in earlier years he would have responded eagerly, the statesman referred him to Dr. Benjamin S. Barton instead (Osborn, 1935, p. 537-38).

Meanwhile the fossil collection of the American Philosophical Society had grown impressively, largely through Jefferson's efforts and with many contributions from others. For example, after Wistar's death in 1818, his widow returned to the Society many items he had borrowed for study, including no less than one hundred eighty-two fossil remains. During the ensuing years these collections were put to good use as occasion offered. Specimens were loaned for study and display in public lectures, and casts of important specimens were provided to other museums and repositories. As the collections of fossils, Indian artifacts, and other items continued to grow, however, space diminished apace. In 1849 the Society made the decision to disperse the collections to appropriate repositories where they would be more useful. The collection of fossils was deposited with the Academy of Natural Sciences of Philadelphia, which had been founded in 1812, and additional transfers were made on four subsequent occasions. At first the arrangement was that the collections would be subject to recall, but in time they were permanently transferred. Most of the surviving fossil remains collected by Jefferson for the American Philosophical Society are presently in the Academy's collections (Bell, 1967, p. 21-34; Gillette and Colbert, 1976, p. 25-38).

The natural curiosities which Jefferson assembled for his private collection including fossil bones were prominently displayed in the entrance hall of Monticello, and often mentioned in the writings of visitors to the mansion (Figure 13). At least twenty paleontological specimens were noted in their accounts, but judging from Jefferson's correspondence it is probable that he had others as well (Tucker, 1837, entry for February 7, 1815; Ticknor, 1876, 1, p. 34; Montlezun, 1818, p. 76-77; Carriere and Moffat, 1943-44, pp. 39-55; Boyd, 1952, *Papers*, 6, p. 201). These were all dispersed in the late summer or autumn of 1826, following the statesman's death. His grandson and executor Thomas Jefferson Randolph assembled the collection of "natural and artificial curiosities" including his scientific instruments at Monticello and delivered it to the University of Virginia in accordance with Jefferson's wishes. These were given into the custody of the University librarian and unfortunately no listing or catalogue was compiled. Thereafter the Jefferson collections were moved from time to time from one place to another at the University, a circumstance which undoubtedly was responsible for

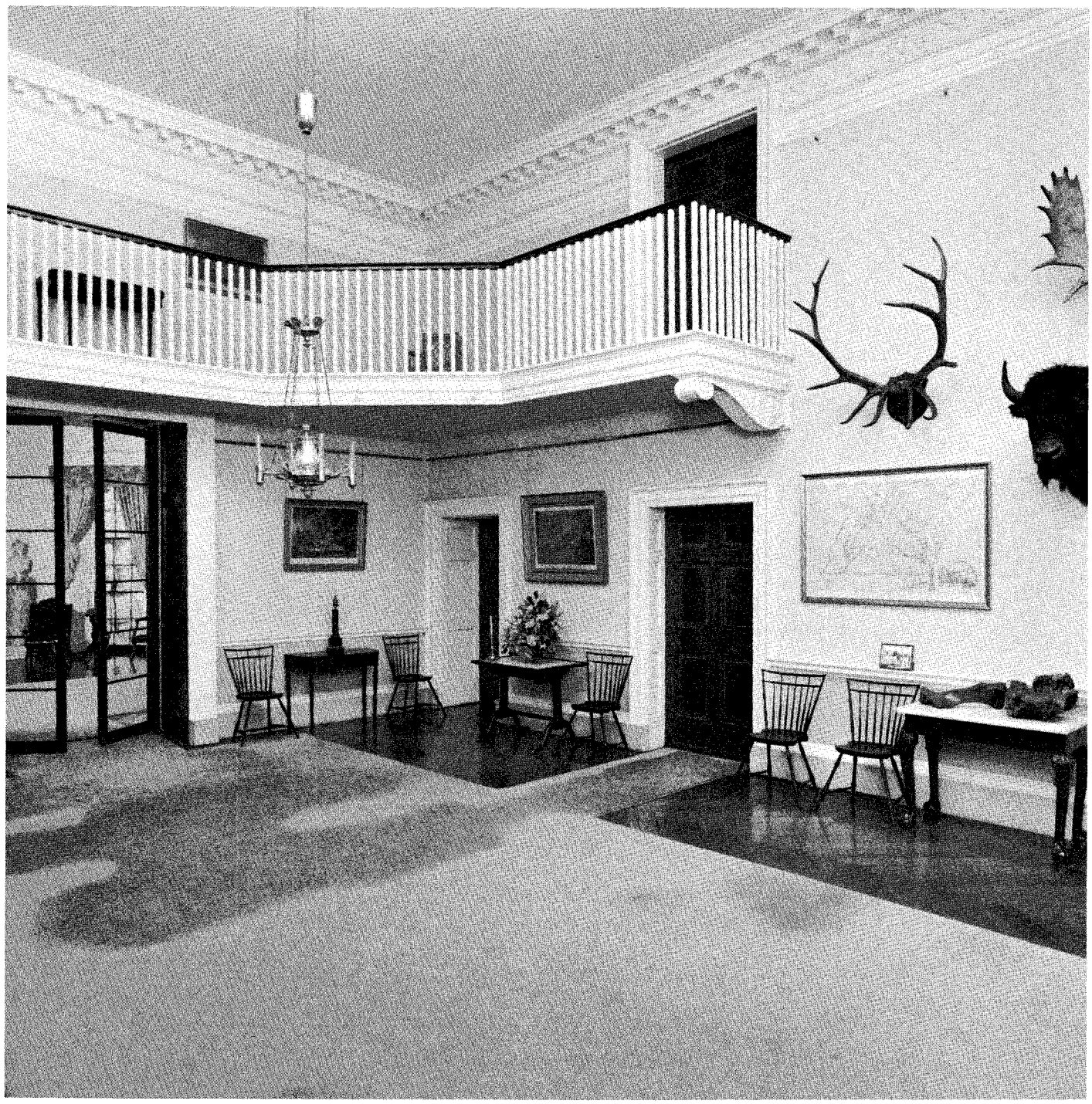
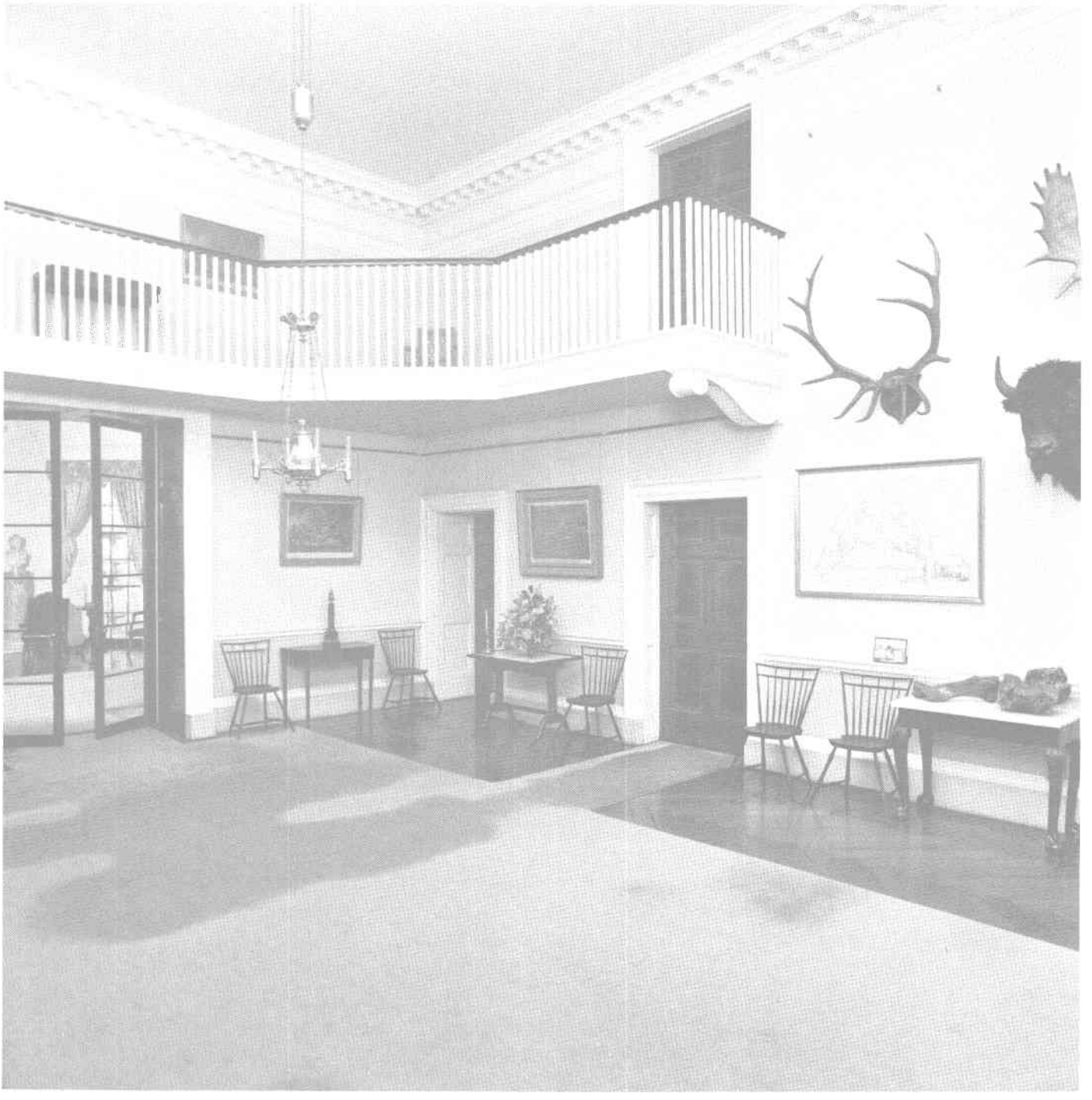


Figure 13. Entrance hall of Monticello, where Jefferson displayed his paleontological specimens and other natural history collections. (Courtesy of the Thomas Jefferson Memorial Foundation).



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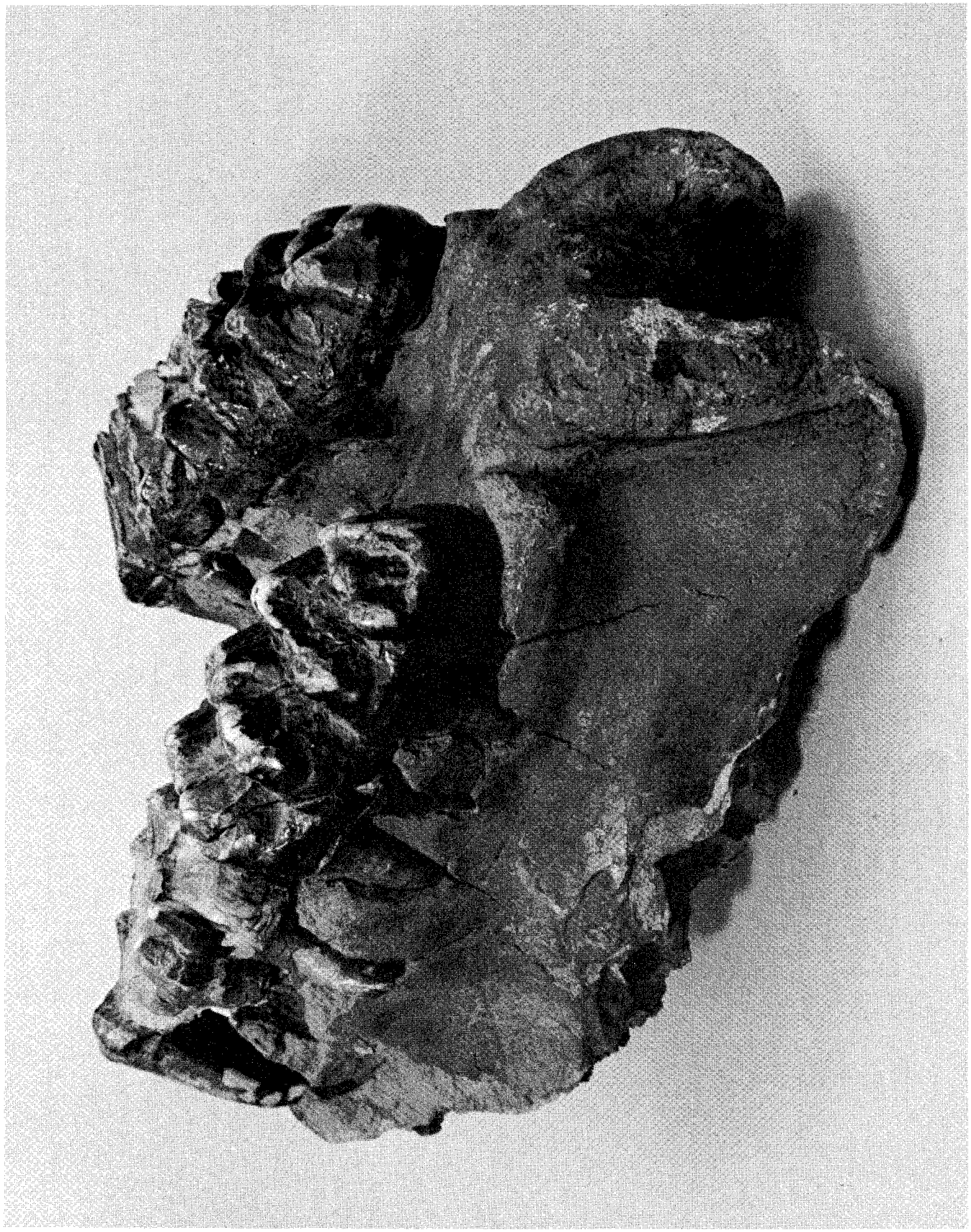
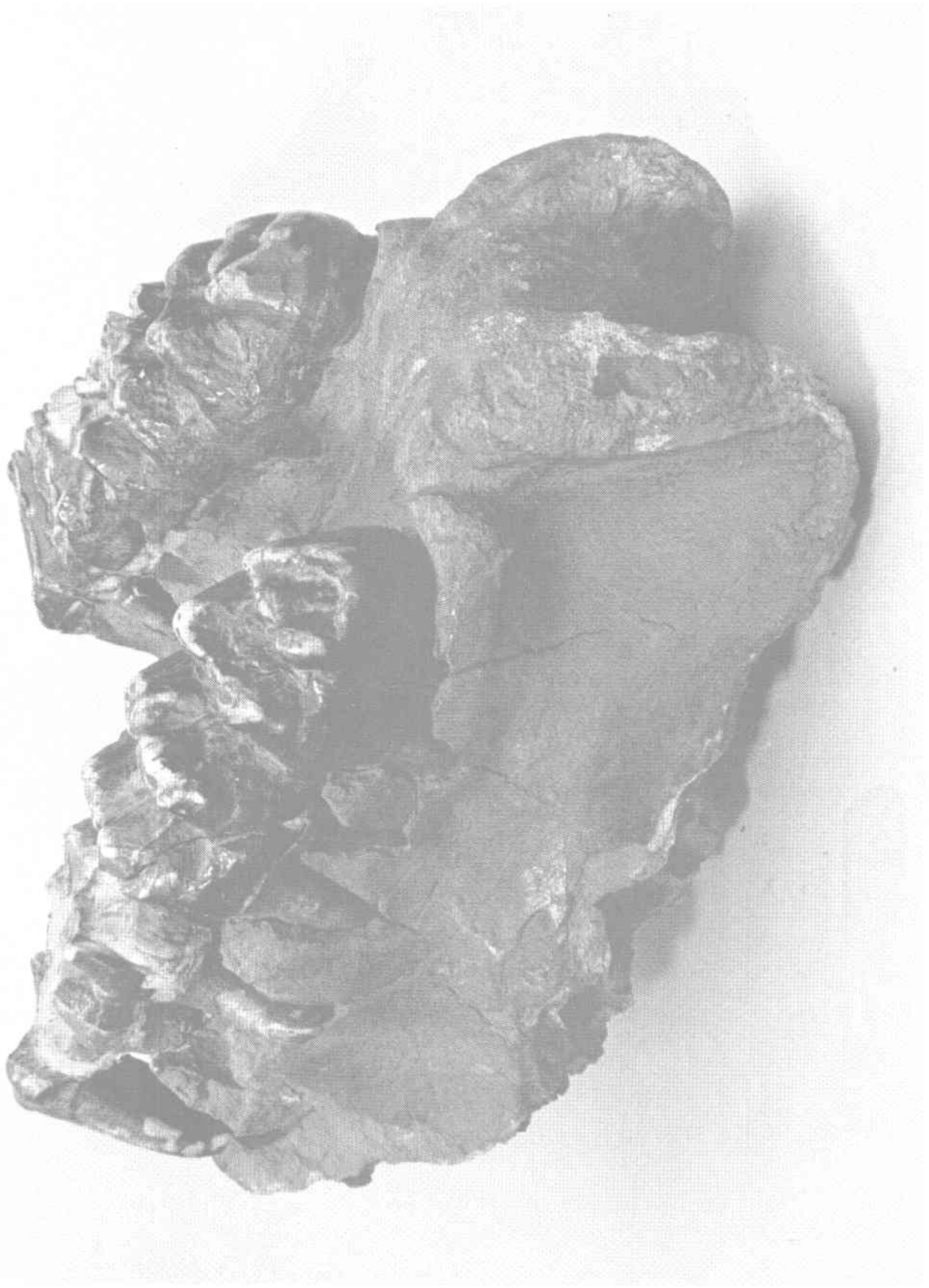


Figure 14. Upper jawbone of *Mammut americanum* (Kerr, 1792) owned by Jefferson and displayed at Monticello. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).



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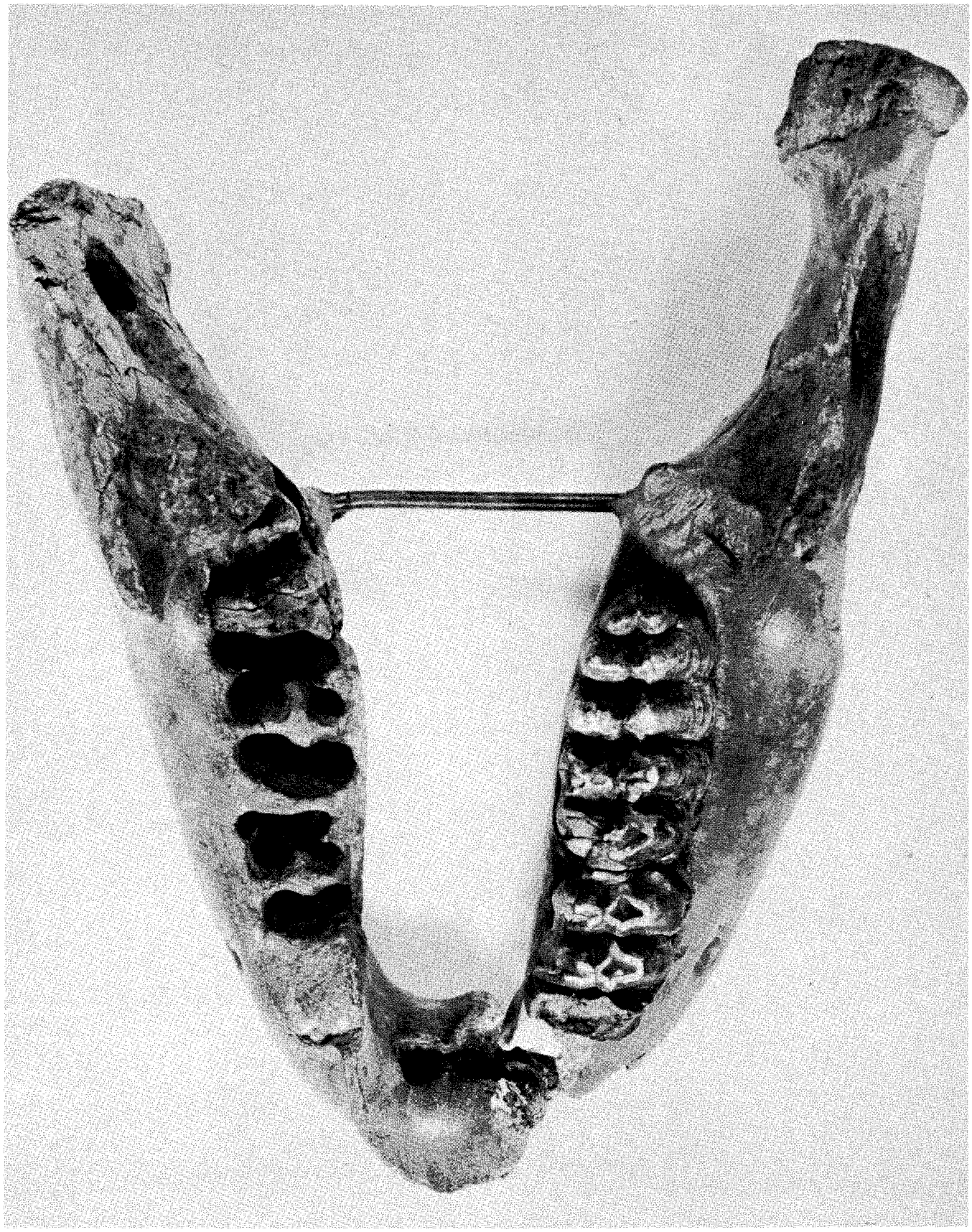

Figure 15. Mandible of *Mammut americanum* (Kerr, 1792) from Jefferson's personal collection displayed at Monticello. Assembled from rami of two different mastodons. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

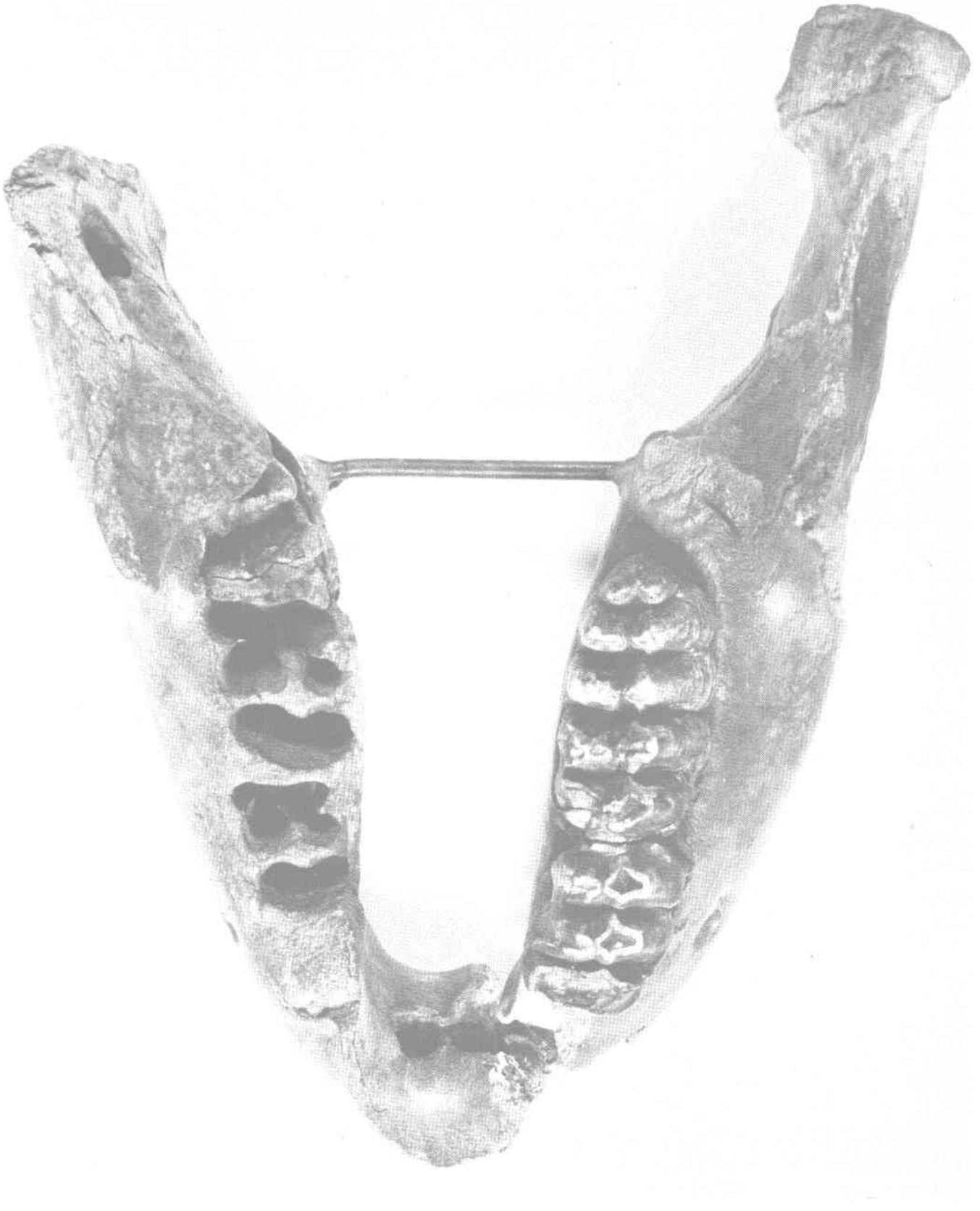

Figure 15. Mandible of *Mammut americanum* (Kerr, 1792) from Jefferson's personal collection displayed at Monticello. Assembled from rami of two different mastodons. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

Figure 16. Side view of the same mandible of *Mammut americanum* (Kerr, 1792) formerly owned by Jefferson. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

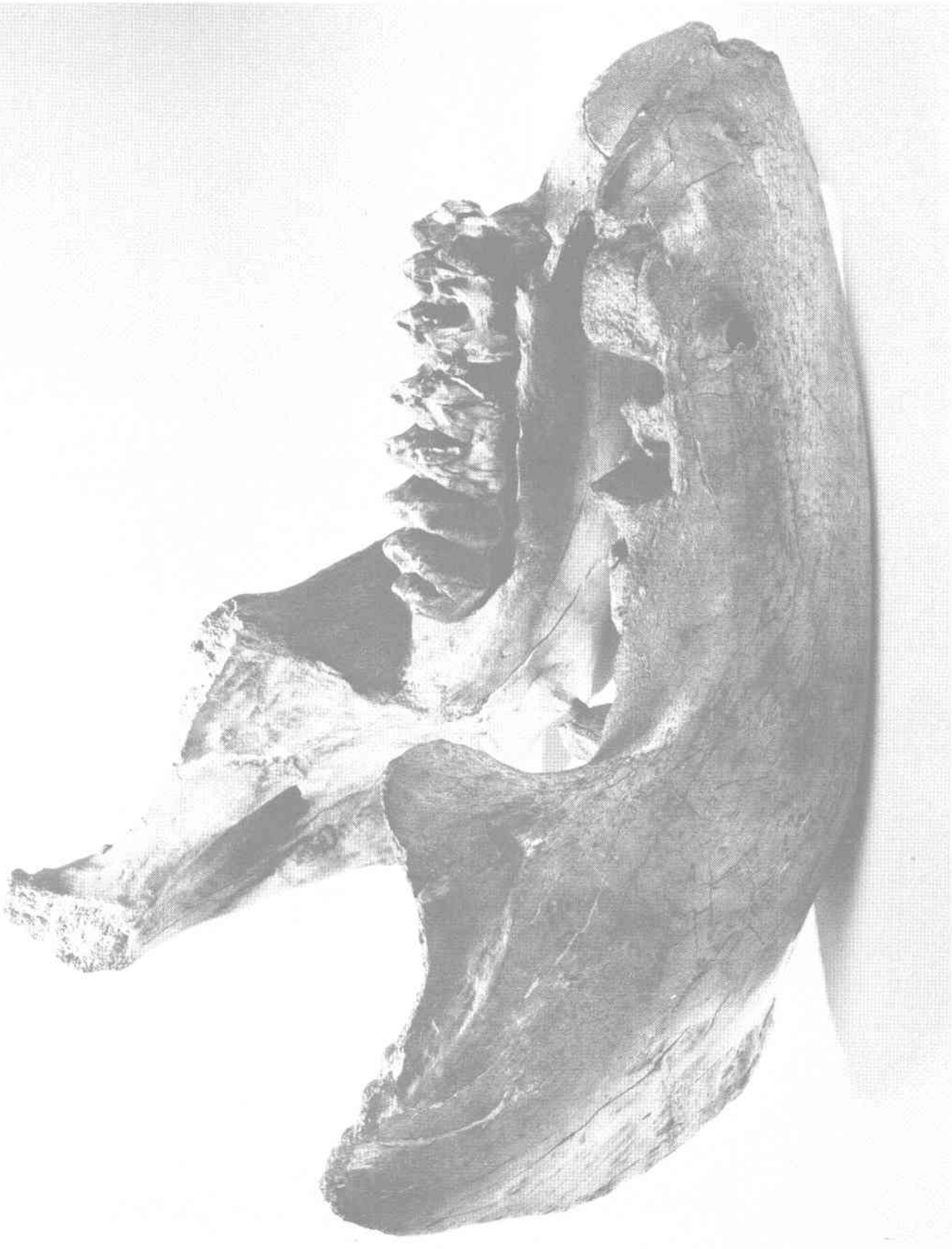

Figure 16. Side view of the same mandible of *Mammut americanum* (Kerr, 1792) formerly owned by Jefferson. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

Figure 17. Diaphysis of a left humerus of *Mammut americanum* (Kerr, 1792) formerly owned by Jefferson. Absence of the epiphysis suggests that this bone is of a young animal. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

Figure 17. Diaphysis of a left humerus of *Mammut americanum* (Kerr, 1792) formerly owned by Jefferson. Absence of the epiphysis suggests that this bone is of a young animal. (Courtesy of the University of Virginia and the Thomas Jefferson Memorial Foundation).

their having avoided destruction in the fire there in 1895. Conversely, however, Jefferson's natural curiosities eventually became interspersed with other collections in the University, and the specimens he had collected at such considerable effort permanently lost their identity (UVA, Ms.; UVA, 1826, *Minutes*).

The only paleontological survivors documented with certainty to have been part of Jefferson's personal collection are several which had been dramatically displayed in the entrance hall of Monticello. Notable among these are the upper and lower jawbones of a mastodon (Figure 14). It has not been possible to determine when or from where Jefferson acquired them, although tradition states that they were obtained from Shawungunk. There is an equally strong possibility that they were procured for Jefferson from Big Bone Lick by one of the Clark brothers. The lower mandible was the subject of interest even during Jefferson's lifetime because of the gross asymmetry in dental ontogeny on the two rami and the difference in wear of the molars (Figure 15). The mandible exists in two separate rami that have been joined together by iron rods and the mandibular symphysis covered with plaster (Figure 16). A recent examination made at the Smithsonian Institution suggests that the mandible was indeed assembled from rami of two different mastodons (Hitchcock, 1931, p. 80-86; Ray, 1982).

It is readily apparent from a survey of Jefferson's involvement with paleontology that he was not the first in the American colonies and republic to collect or study fossil vertebrate remains. He was, however, the first in America to have published on the subject, in his *Notes on the State of Virginia* and then in the *Transactions* of the American Philosophical Society. He was not a scientist, nor did he ever claim to be one. Particularly he lacked training in organized systematics or comparative anatomy essential for scientific study of paleontology. In fact no one else in his time had such training. In his time there was little if any scientific information available on the age of the earth, geological revolutions or the survival or extinction of species. As Jefferson wrote, "What a field have we at our doors to signalize ourselves in! The botany of America is far from being exhausted: its Mineralogy is untouched, and its Natural history or Zoology totally mistaken and misrepresented...." (Boyd, 1958, *Papers*, 14, p. 699). Furthermore, because of his public responsibilities, Jefferson was unable to engage in field work. In his writings he constantly counseled the importance of the scientific method and the dangers of theorizing without sufficient evidence. His greatest deficiency was his stubborn refusal to admit that some fossil remains were of animals that had become extinct. His contention was based on the sound scientific method of not accepting negative evidence, undoubtedly derived from his training as a lawyer. He reasoned that inasmuch as the major part of the North American continent was as yet unexplored, the possibility that animals still unknown continued to roam the wilderness should not be discounted (Figure 17).

Jefferson's many and substantial contributions to the development of American vertebrate paleontology should not be overlooked or denigrated. Of considerable importance to the development of American vertebrate paleontology was his tenacious pursuit of fossil remains at considerable expenditure of his own funds, as well as his encouragement of the collecting and study of fossil remains by others. In this manner he succeeded in promoting wide interest and support of the subject during its embryonic period. Not to be disregarded was the impact on such studies that Jefferson's position as one of the nation's most notable citizens brought to them. It helped to create a political and social ambience by means of which the studies prospered. Throughout his more than thirty years in public office, his unflagging and productive pursuit of fossil specimens by means of voluminous correspondence and financial support of expeditions were major factors in fostering interest in and encouragement of fossil study in his time. It was primarily because of his efforts that many specimens were preserved that otherwise would have been dispersed and lost. Although the paleontologist George Gaylord Simpson was occasionally inclined to disparage the importance of Jefferson's role, and unjustly so, he nevertheless admitted (Simpson, 1942, pp. 155, 157):

> ... he made two contributions such as no other man of the time could or did make: he helped to make paleontology an honored and respected pursuit, and he was largely instrumental for bringing together the materials necessary for its advancement ....

NOTE

The writer gratefully acknowledges the assistance of Samuel O. Bird, Virginia Division of Mineral Resources; David D. Gillette, New Mexico Museum of Natural History; Clayton E. Ray, National Museum of Natural History, Smithsonian Institution; Charles Smart, Academy of Natural Sciences of Philadelphia; and Frank Whitmore, U. S. Geological Survey.

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